United States
Department of
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Forest Service
Southern Region

Beef Cattle Husbandry Study Course

Range Management Group
Fisheries Wildlife and Range Management Staff Unit

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BEEF CATTLE HUSBANDRY

Study Course

By
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Fisheries, Wildlife and Range Management Staff Unit

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PREFACE

This publication is designed to give people involved in Range Management a better insight into the beef cattle industry. Much more information is included than you will use in your day-to-day operations. The additional information will allow you an understanding of the terms used by people in the beef cattle industry. A better knowledge of beef cattle and the management of livestock will enable you to communicate better with farmers and ranchers who graze their cattle on Forest Service lands, as well as with others in the cattle industry.

Questions appear after each section in the text. Write your Answers and verify them before continuing on. If you cannot answer the question, review the preceding text so that you understand the questions and answers.

Answer or attempt to answer each question, or reread the text and then answer the questions before checking the answer sheet in the back of the text.

A self-scoring sheet appears at the end of this book. For each answer check the "right" or "wrong" column. Forest Service employees who use this publication as a training text should return the scoring sheet to the Range Management Staff, Regional Office, Atlanta, Georgia. By answering the questions you will reinforce your understanding of the text, and retain more information. This is a self-study, self-scoring and self-motivated correspondence course that you can complete as time permits.

This book is not a part of the Forest Service Directives System. The book is primarily for use in training and to improve the quality of the job we do.

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American Galloway Breeders Association
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American Hereford Assocation
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Texas Simmental Association
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HISTORICAL BACKGROUND OF THE CATTLE INDUSTRY

Man probably first used cattle as a source of meat and hides. Cattle are generally considered, however, to have been the first animals domesticated by man for purely agricultural purposes.

The domestication of wild cattle was probably coincidental with man's transition from savagery to the first primitive civilization, early in the Neolithic Age. Herding of cattle was one of the first indications of the superiority of one tribe over another and marked the beginning of community life and cultural development in contrast to the nomadic life and simple culture of the hunter. Cattle have served through the ages as objects of worship and mythology, as sacrificial offerings, and for other uses as well as for a source of meat, milk, and hides, and as beasts of burden and sources of power. Early drawings, carvings, and writings of the Sumerians of old Mesopotamia, and in ancient Egypt and India, indicate man's use of cattle in those countries as early as 4000 to 5000 B.C.

From the early centers of culture, domestic cattle spread to all parts of the world with the spread of civilization.

Origin of Cattle

Cattle are classed in the family Bovidae, which includes ruminants with hollow horns and hoofs with an even number of toes. Fossil remains of this species have been ascribed to the Miocene Age. Domestic cattle are descended from wild cattle of the genus Bos. Besides cattle this genus includes the following living forms: banteng, bison, gaur, gayal, musk ox, true buffalo, yak, and zebu.

Five groups or subgenera are noted in the genus Bos:

Taurine - Included here are the common and the humped cattle. Commonly, cattle are grouped under one species, Bos taurus; however, a separate species name (Bos indicus) is given to the zebu group, those of the division bearing a hump. A wide variety of the zebu group, all domesticated, exists in Asia and Africa. They have been used to improve the cattle of the coastal region of the Gulf of Mexico as well as in other sub-tropical and tropical areas.

Bibovine - This group embraces the banteng, gaur, and gayal, which are closely related and cross readily. These are humped forms native to southern India. Compared with the taurine group, they are shorter in

the forehead and have less width at the base of the horns, which are massive and heavy. A few of the gaur have been domesticated; the gayal has long been more or less domesticated. The banteng, common on the Malay Archipelago and the islands of Java, Borneo, and Sumatra as well as in India, is widely domesticated.

Leptobovine.--This group is now extinct. Fossil remains of this subgenera have been found in France, Italy, and India.

Bisontine.--Embraced in this group are the yak and the bison, which have voices resembling those of swine. The yak is indigenous to the mountainous areas in central Asia, and wild herds still exist in that section. The domesticated form of the yak is regarded as being a cross between the wild yak and some of the taurine group. To this group belongs the American bison, incorrectly called the buffalo, which has resisted domestication except for the "cattalo"--a cross with domestic cattle.

Bubaline.--This group is that of the true buffalo of Asia and southeastern Europe. They are distinctive in head shape and horns as well as in body. They are widely used for draft, for beef, and for milk production.

Usefulness to Man

The taurine group leads in usefulness to man; however, the Asiatic buffalo, banteng, gayal, and yak have major importance in some areas. Our domestic cattle descended mainly from European cattle of which there were many wild species, or geographical varieties. Four wild forms were the foundation for our present breeds:

Bos taurus primigenius.--These are the urus, aurochs, or giant ox that existed in the early Neolithic Age. They were very large cattle, being six or seven feet high at the withers. The following breeds are among those that probably descended from this species: Holstein-Friesian, Shorthorn, Aberdeen Angus, Polled Shorthorn, Red Polled, Dutch Belted, Galloway, West Highland, and Normandy.

Bos taurus longifrons.--This species, often referred to as the "Celtic ox," was much smaller than the primigenius and also existed in the Neolithic Age. Its smaller size is regarded by some authorities as being due to unfavorable environment. Among the breeds existent today, the Brown Swiss and Jersey probably descended from this species. Guernseys probably came from this same foundation stock crossed with primigenius.

Bos taurus brachycephalus.--These are the short-headed cattle of our present breeds. Kerry, French Canadian, Brittany, Sussex, Devon, and probably the Hereford came from this foundation.

Bos taurus frontosus.--This species has been found in fossil remains in Sweden. The breeds of Sweden, the Simmental, and other spotted breeds now in Switzerland and south Germany are of this type.

Question No. 1

Match the following wild species of cattle with the listed breeds that probably descended from each.

a. Bos taurus primigenius (Giant ox)_____

b. Bos taurus longifrons (Celtic ox)_____

c. Bos taurus brachycephalus _____

d. Bos taurus frontosus_____

e. Bos indicus_____

Match with the above species:

(1) Simmental	(4) Shorthorn
(2) Hereford	(5) Aberdeen Angus
(3) Jersey	(6) Brahman

Introduction into the Americas

The first cattle to reach the western hemisphere were brought over by the Norsemen who landed in "Vinland" (Massachusetts) in 1000. Cattle were brought to North America by Christopher Columbus on his second voyage in 1493, and in 1521 cattle of the Spanish type were taken from the West Indies islands to Vera Cruz, Mexico. Some historians credit Ponce de Leon with bringing the first cattle into Florida in 1521. They note that possibly some remained after the Spanish were forced by the Calusa Indians to retreat to Cuba. Akerman, in the Florida Cowman, A History of Florida Cattle Raising, says that Ponce "brought a small herd of Andalusia cattle, the first record of domestic cattle being brought into what is now the continental United States." The first importation made by a colony which would later become one of the United States was made in 1535 to Virginia, but they perished or were slaughtered. The first sizable importation reached Jamestown in 1611. Cattle production increased rapidly in New England, and cattle owned by individuals were grazed in combined herds. With the growth of the population and subsequent increase of cattle, the common pasture (or commons) for the villages became inadequate for the herds and many new towns were settled to provide pastures for the grazing animals.

Coronado, in 1540, was the first to bring livestock into what is now western United States. He journeyed through the Southwest and into Colorado and Kansas after leaving Compostela, Mexico, with 1,300 horses and mules, and large numbers of cattle, sheep, and hogs. Additional Spanish expeditions soon followed. The Franciscan missions, established in northern Mexico after 1582, were instrumental in extending colonies and livestock in the southwestern states. In 1609, the town of Santa Fe with its livestock grounds was founded; and in 1696 missions and stockbreeding grounds were established in Arizona. These settlements became important stock centers early in the eighteenth century.

The first successful introduction of livestock into what is now the eastern United States occurred in 1565, at St. Augustine, Florida, 25 years after Coronado had moved domestic stock into the Southwest. Between 1521 and 1539, DeSoto and other Spanish explorers landed horses in the Southeast; apparently none of the animals survived. From 1611 to 1675, numerous livestock importations were made from both the European homelands and the West Indies and the livestock industry became firmly established.

By 1700 large numbers of livestock were moving into the interior. Among the larger livestock movements were those by the French who, between 1732 and 1788, settled in Illinois and Indiana and drove many animals southward from Canada. The French also brought many livestock into Louisiana where, in 1718, they founded the city of New Orleans. By 1850, livestock were on all of the interior frontiers.

The Great Plains became cow country by 1880. The "longhorn" cattle came in from the south and the descendants of the British breeds from the east. As early as 1850 and until the late '80's, millions of cattle traveled the cattle trails from Texas to cattle ranges in the Northern Great Plains and to railroad shipping points in Kansas and Missouri.

Later, the cattle industry became centralized in the western range country because of the available forage, and in the North Central (corn belt) States because of the abundance of concentrated feeds and pasture.

Question No. 2 When were the first cattle brought to the western hemisphere?

Livestock Grazing on National Forests in the Southern Region

Landowners grazed livestock on proposed National Forest land in the Southern Region before the land was purchased by the Forest Service. The grazing was allowed to continue during purchase and even after the purchase units became National Forests. The grazing use was unregulated with virtually no control except by the owner of the livestock. Hogs, sheep, goats and cattle grazed almost at will under the open range concept (tables 1 and 2). Very few records were kept during the early years. Available records show that the Region made some attempt to operate in accordance with Forest Service Manual instructions and guidelines in controlling livestock use. For the most part, the reports show no rhyme or reason between permitted use, actual use and unregulated use. Numerous attempts were made to control unregulated livestock use. In 1935 the Region recognized the need for a strong grazing policy. The Region was expanding its huge acquisition and tree planting program. Cattle, sheep, and hogs overran the forests, controlled only by theft, starvation, Texas tick fever, hog cholera, and the screw worm.

Table 1. Unregulated livestock grazing, 1940 - 1947

1940	99,360	animals
1941	95,047	animals
1942	100,752	animals
1943	94,669	animals
1944	95,239	animals
1945	97,477	animals
1946	98,398	animals
1947	100,463	animals

Table 2. Unregulated livestock grazing, 1959 - 1981

Year	All Animals	Cattle	Sheep	Hogs
1959	107,298	65,864	10,163	31,271
1964	87,484	51,516	3,571	32,397
1969	14,137	5,671	318	8,148
1972	5,341	1,784	25	3,532
1974	1,251	491	25	735
1976	628	576	0	52
1977	1,708	636	23	1,049
1978	1,940	889	6	1,045
1979	715	430	0	285
1980	1,586	471	0	1,105
1981	2,057	541	0	1,510

Because of drought in the West and Midwest, cattle from those regions were being shipped into the southern ranges, adding to the problem of conflict with timber production. Because of the damage to young pine stands from uncontrolled grazing coupled with wildfire used by cattlemen to make the grass more palatable, a general resistance to livestock use was developing among forest officers. Without a uniform Regional policy, Forest Supervisors had a wide latitude for developing a local policy consistent with their individual backgrounds and extent of their difficulties with livestock use. A policy was finally written and approved in 1950, and revised in March 1974.

The policy of the Southern Region is to develop, manage, and protect the forage resource and to permit and regulate the grazing use thereof. Domestic livestock grazing will be permitted on those areas that are determined to be suitable and where the forage resource can be used and managed in coordination with other resources.

Development of the forage resource for the use and benefit of minority groups and the rural poor will be emphasized. Range analysis information and range resource management alternatives will be an integral part of Unit Planning.

Range Analysis will be scheduled and conducted by priority.

The long-term objectives for the use and management of the forage resource are:

1. Inventory forage resource and allotment characteristics. Determine suitability for grazing, forage production, grazing capacity, and allotment features as set forth in the Range Analysis and Management Handbook. The estimated grazing capacity for livestock will allow for adequate wildlife use, timber regeneration, and other resource management activities that affect the allotment.

2. Management of the range resource. Allotment Management Plans will be developed for each range allotment based on the Forest Land Management Plan. Interim range management plans will be developed as necessary prior to Unit Plans.

A deferred-rotation or similar system of grazing that will meet coordinated resource management objectives will be used on each allotment.

3. Grazing permits. All grazing use on National Forest lands will be authorized by grazing permit.

4. Control of unauthorized use and trespass livestock. Control of permitted livestock will be achieved through ear tagging and periodic counts.

5. Qualified personnel. Qualified professionals and technicians will be identified, recruited, and developed to work in the range management function.

The Region had nearly 25,000 head of livestock grazing 206,000 animal unit months in 1979. Unauthorized use by 715 cattle and horses and 285 hogs occurred on National Forest land. The Region has progressed from uncontrolled grazing to control under permit. In the future, grazing under permit will continue, and better livestock management will be emphasized as allotment fencing is completed and grazing management systems are implemented.

CATTLE POPULATIONS

Table 3 shows the numbers of cattle on farms and ranches in the United States.

Table 3. Cattle on farms, January 1, 1890-1981, in thousands

Year*	All cattle	Beef cattle	Milk cattle
1890	60,014	43,470	16,544
1900	59,739	40,289	19,450
1910	58,993	37,538	21,455
1920	70,400	47,825	22,575
1930	61,003	34,921	26,082
1940	68,309	40,539	27,770
1950	77,963	54,501	23,462
1960	96,236	76,709	19,527
1970	112,369	96,398	15,971
1971	114,578	98,826	15,752
1972	117,862	102,258	15,604
1973	121,539	106,045	15,494
1974	127,788	112,550	15,238
1975	132,028	116,721	15,307
1976	127,980	112,935	15,045
1977	122,810	107,886	14,923
1978	116,375	101,593	14,782
1979	110,864	96,142	14,722
1980	111,192	96,255	14,937
1981	115,013	99,791	15,222

*1890-1960 information is from the World Almanac 1969. Beginning in 1970, includes Alaska and Hawaii; 1970-1981 information is from Agricultural Statistics 1981.

State Rankings for Cattle

Table 4 and figure 1 give the state rankings for the classes indicated as reported by the Economics, Statistics, and Cooperatives Service.

Table 4. Rankings and numbers by States, January 1, 1981, in thousands

	All cattle		Beef cows** 2 yrs. & over		Milk cows 2 yrs. & over		Steers 1 yr. & over	
Rank	State	Numbers	State	Numbers	State	Numbers	State	Numbers
1	*TX	13,500	*TX	5,880	WI	1,820	*TX	1,870
2	IA	7,450	MO	2,315	NY	915	IA	1,683
3	NB	6,950	*OK	2,288	CA	909	KS	1,666
4	KS	6,450	NB	2,069	MN	880	NB	1,639
5	MO	5,550	KS	1,897	PA	718	CA	814
6	*OK	5,400	IA	1,860	MI	390	*OK	750
7	CA	4,760	SD	1,642	IA	378	MN	690
8	WI	4,550	MT	1,439	OH	375	CO	644
9	SD	4,190	*FL	1,333	*TX	320	MO	583
10	MN	3,800	*AR	1,170	MO	260	IL	461
11	CO	3,125	*KY	1,057	*KY	243	SD	387
12	MT	2,675	CO	1,009	IL	230	WI	370
13	IL	2,650	CA	995	*TN	215	AZ	361
14	*KY	2,600	*TN	975	IN	207	ID	314
15	*FL	2,480	*AL	946	WA	200	IN	277
16	*TN	2,400	ND	910	VT	190	PA	269
17	*AR	2,300	*MS	893	*FL	187	WA	257
18	PA	2,050	*GA	850	*VA	173	OH	254
19	ID	1,990	OR	729	ID	159	*VA	214
20	*AL	1,925	*LA	721	SD	155	NM	209
21	*GA	1,910	IL	708	*NC	135	*KY	200
22	ND	1,850	*VA	677	*GA	130	MI	192
23	OH	1,815	ID	671	MD	124	OR	158
24	NY	1,831	WY	635	KS	123	ND	148
25	*MS	1,800	NM	576	NB	121	MT	146
26	IN	1,800	MN	570	*LA	112	*TN	145
27	*VA	1,800	IN	483	*OK	112	*GA	99
28	OR	1,750	*NC	433	*MS	97	WY	97
29	NM	1,450	OH	385	OR	96	*AR	85
30	WA	1,450	WA	373	ND	93	*AL	83
31	MI	1,380	UT	347	*AR	80	*FL	81
32	*LA	1,360	NV	325	UT	77	UT	77
33	WY	1,350	AZ	285	AZ	75	*NC	66
34	*NC	1,160	*SC	280	CO	71	WV	45
35	AZ	1,075	WI	279	*AL	64	*LA	43
36	UT	875	WV	259	ME	55	*MS	42
37	NV	640	PA	215	NM	49	NV	40
38	*SC	625	MI	155	*SC	48	*SC	37
39	WV	570	NY	110	CT	48	NY	35
40	MD	410	MD	93	MA	44	MD	28
41	VT	339	HI	80	NJ	41	HI	23
42	HI	220	NJ	15	WV	36	NJ	6
43	ME	131	ME	13	NH	30	MA	4
44	NJ	104	VT	11	MT	29	ME	3
45	CT	103	MA	10	NV	15	DE	3
46	MA	103	CT	7	HI	13	VT	2
47	NH	69	NH	5	WY	12	CT	2
48	DE	32	DE	5	DE	10	NH	2
49	RI	8	AK	2	RI	4	AK	1
50	AK	8	RI	1	AK	1	RI	0
TOTALS		114,813		38,986		10,869		15,605

* States for the Southern Region.
** Does not include all beef cattle as figure 1.

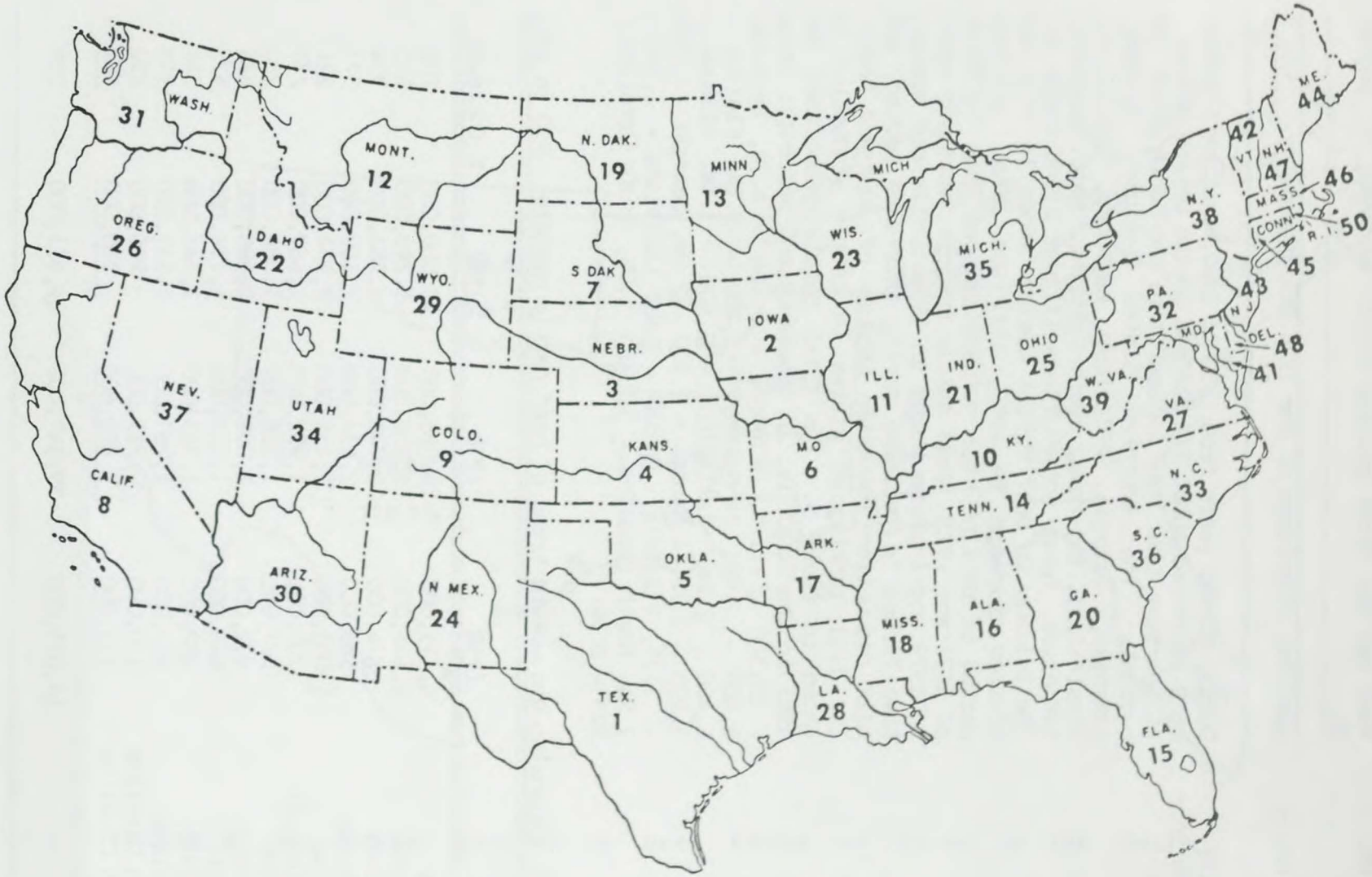

FIGURE 1. Rank of States in Beef Cattle Numbers — January 1, 1978

Question No. 3 — When was the first grazing policy approved for Region 8?

Question No. 4 — List two objectives of the 1974 Grazing policy.

Beef Cattle Production in the South

During the 30 years from 1950 to 1980, beef cattle numbers increased about 177 percent in the United States at the same time they increased in the South about 259 percent. The Southern States include Alabama, Arkansas, Georgia, Florida, Kentucky, Louisiana, Mississippi, Oklahoma, North Carolina, South Carolina, Tennessee, Texas and Virginia (figure 2 and table 4). The buildup in beef cattle numbers ended in 1975 and started downward in 1976, 1977 and 1978. In this period of decline, the numbers dropped back to those of 1971 and 1972. Beef cattle numbers decreased again in 1979 and increased some in 1981. Milk cow numbers have tended to decrease during this same period, but milk production increased because of improved herds. The 1981 ranking of states in cattle production is shown in table 5. The total cattle production for 1981 in the South is, in thousands and percents: Texas - 13,500 - 11.7%, Oklahoma - 5,400 - 4.7%, Kentucky 2,600 - 2.3%, Tennessee - 2,400 - 2.1%, Florida - 2,480 - 2.2%, Mississippi - 1,800 - 1.6%, Alabama - 1,925 - 1.7%, Arkansas - 2,300 - 2.0%, Georgia - 1,910 - 1.7%, Virginia - 1,800 - 1.6%, Louisiana - 1,360 - 1.2%, North Carolina - 1,160 - 1.0%, South Carolina - 625 - 0.5%.

Table 5. Expansion and upward trend of beef cattle numbers, 1950 to 1981

State	1950	1978	1981	% Increase
Texas	6,471,000	14,096,000	13,080,000	202
Oklahoma	1,615,000	5,756,000	5,248,000	325
Kentucky	674,000	2,746,000	2,253,000	334
Tennessee	563,000	2,436,000	2,100,000	373
Florida	1,005,000	2,115,000	2,254,000	224
Mississippi	702,000	1,992,000	1,667,000	237
Alabama	567,000	2,028,000	1,586,000	280
Arkansas	472,000	2,009,000	2,188,000	464
Georgia	466,000	1,802,000	1,736,000	373
Virginia	452,000	1,365,000	1,546,000	342
Louisiana	823,000	1,267,000	1,213,000	147
North Carolina	150,000	915,000	980,000	653
South Carolina	115,000	620,000	560,000	487
TOTALS	14,075,000	39,147,000	36,411,000	259

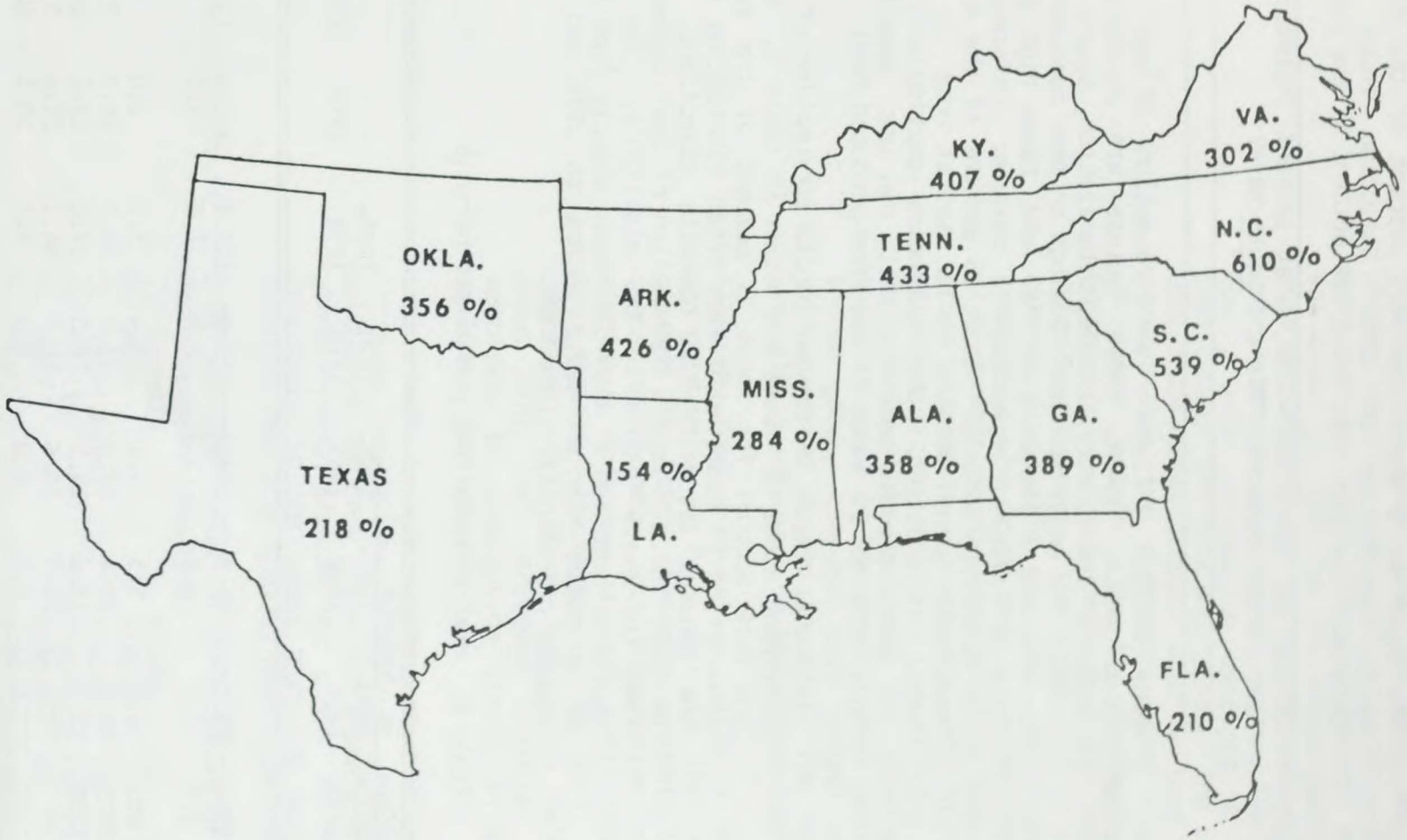

FIGURE 2. Percentage Increase in Beef Cattle on Farms in the South. January 1, 1950—January 1, 1979

The South as a whole had 34.1 percent of the total cattle production in 1981. Excluding Texas and Oklahoma, the South had about 18% percent of the total.

Question No. 5 — During the years 1950-1980, what percent increase in beef cattle production did the South have?

The Trend in Beef Consumption

Many factors influence the consumption of beef and other meats. Among these factors are population, region of the country, income, urbanization, supply and price. The major research findings on meat consumption in the United States show that meat ranks high as a food in terms of expenditures, consumer preferences, and nutritive content. About 25 percent of the money households spend for food to be used at home is for meat. In addition, some households--particularly in the South--produce meat for their own use, amounting to a fifth of the value of all home-produced food.

Historical trends in the per capita consumption of the different kinds of meats are shown in table 6. Beef and pork account for about 71 percent of the total consumption of meat, with each often fluctuating from the general trend in the opposite directions. In general, the per capita consumption of beef decreased from the early 1900's to the mid-1930's. The per capita consumption of beef increased sharply from 1951 to a record high of 129.3 pounds in 1976 and has dropped off slightly since then.

Table 6. Meat consumption, pounds per person[1/]

Commodity	Average 1935-1939	Average 1950-1959	Average 1960-1964	Average 1965-1969	Average 1970-1974	Average 1975-1978	1979	1980
Beef	55.6	75.3	91.3	106.1	113.8	122.1	105.5	103.4
Lamb & mutton	6.8	4.3	4.8	3.7	2.9	1.8	1.5	1.6
Veal	8.1	8.4	5.5	4.1	2.4	3.7	2.0	1.8
Pork	56.5	66.0	64.4	69.9	71.2	58.7	68.7	73.4
Fish	11.0	13.3	13.6	14.5	16.3	17.0	17.1	16.8
Chicken	-	25.6 2/	29.9	36.6	40.9	44.1	51.6	51.1
Turkey	-	5.6 2/	6.9	8.0	8.5	9.1	10.1	10.6

1/ Data from Agricultural Statistics, USDA; annual editions, 1935-1980.
2/ Average of years 1955-1959.

Surveys have shown that the West and North Central regions used the most beef per person--80 to 90 percent more than the South. The Northeastern region's average was close to that for the whole country. Urban and farm households used about the same quantity of beef per person in each region, except the South. In the South, urban consumption averaged 50 percent larger than that of the farm population. The influence of the disposable money income level on beef consumption is greater than the difference among either regions or urban-farm groups. On the average, higher income households used much more beef per person than those with lower incomes. The difference in beef consumption between households at lower and higher levels was greater in the South than in other regions. It was also greater among rural nonfarm than among farm or urban households. Households with higher income used more per person of higher priced cuts, such as steaks and roasts, but less beef for stewing and boiling, than did those in the lower income groups. The middle income groups consumed more ground beef than those with lower or higher incomes. The income level has very little influence on the consumption of pork.

Although food consumption patterns or food habits change slowly, we have evidence that the consumption of meat and other livestock products has been upward since World War II. Consumption of fruits and vegetables decreased steadily until 1964-1965 and then has steadily increased up to 1977. Cereals have decreased until about 1961, then held steady until about 1970, then decreased slightly. Potatoes have decreased in consumption almost in a straight-line decline. See table 7.

Improvement in the quality of beef produced should increase consumption. About 60 percent of our beef production is from grain fed animals of the top three grades--prime, choice, and good. As better bulls are introduced to the herds more and more beef will be produced from high quality beef type animals.

Question No. 6

What was the trend in consumption of the following foods between 1949-1977?

1.	Cereals	Stable___	Up___	Down___
2.	Pork	Stable___	Up___	Down___
3.	Vegetables	Stable___	Up___	Down___
4.	Fruits	Stable___	Up___	Down___
5.	Beef	Stable___	Up___	Down___
6.	Fish	Stable___	Up___	Down___
7.	Lamb and Mutton	Stable___	Up___	Down___
8.	Chicken	Stable___	Up___	Down___
9.	Potatoes	Stable___	Up___	Down___

Table 7. Per capita consumption by major food groups in the United States, 1949-1980

Year	Fruits	Vegetables	Cereal	Potatoes	Fish	Beef	Pork
1949	163.5	216.1	169	118.8	12.9	63.9	67.7
1950	150.5	214.7	167	114.2	13.8	63.4	69.2
1951	157.8	210.6	165	117.2	13.2	56.1	71.9
1952	154.6	207.5	162	105.9	13.3	62.2	72.4
1953	150.0	205.0	158	112.1	13.6	77.6	63.5
1954	146.0	201.9	155	111.6	13.5	80.1	60.0
1955	143.4	202.7	152	113.7	12.9	82.0	66.8
1956	144.3	203.1	150	107.2	12.9	85.4	67.3
1957	143.6	201.7	148	112.6	12.8	84.6	61.1
1958	139.9	199.0	149	107.3	13.3	80.5	60.2
1959	142.9	197.3	148	109.7	13.7	81.4	67.6
1960	141.9	199.9	147	109.5	13.2	85.2	65.2
1961	136.9	197.9	146	110.0	13.7	88.0	62.2
1962	133.4	196.9	144	108.8	13.6	89.1	63.8
1963	123.7	197.6	144	111.6	13.6	94.5	65.5
1964	124.0	194.6	144	104.9	13.8	99.9	65.3
1965	127.5	194.7	144	86.5	14.2	99.5	67.2
1966	129.4	193.5	143	92.2	14.4	104.2	65.7
1967	131.8	197.7	145	82.4	14.2	106.5	72.0
1968	127.8	202.6	145	87.5	14.8	109.7	73.4
1969	133.5	200.0	147	84.9	15.1	110.8	71.4
1970	134.9	200.5	142	83.3	15.8	113.7	72.7
1971	134.1	201.5	142	82.2	15.6	113.0	79.0
1972	129.7	203.6	141	82.9	16.6	116.1	71.3
1973	130.8	207.5	144	78.9	17.1	109.6	63.9
1974	130.4	208.2	143	75.8	16.4	116.8	69.1
1975	137.8	206.0	146	81.4	16.4	118.8	55.4
1976	138.6	204.2	150	77.3	17.2	127.6	58.7
1977	134.7	206.7	147	82.0	16.8	124.0	60.5
1978	135.2	207.9	145	80.2	17.5	117.9	60.3
1979	136.4	211.0	150	82.1	17.1	105.5	68.7
1980	140.4	210.1	150	81.0	16.8	103.4	73.4

The Supply Outlook for Beef Cattle

Historically the supply, or number of beef cattle on farms, has followed a rather regular pattern or cycle. The length of a cycle varied from about 14 to 17 years from 1900 to the 1930's with numbers of cattle on farms increasing for about 7 or 8 years followed by decreasing numbers for the same length of time. However, in recent years the length of cycles has been uncertain; the 1938-49 cycle was 12 years, the 1949-58 was 10 years, the 1958-76 was 19 years. The last three cycles if averaged out would be 13.6 years. We are now in a new cycle. Cattle numbers have fallen from a high in 1975 of 132,028,000 to 116,265,000 head. The number of milk cows on farms continued their

decline during the 1960's and 1970's. However, milk production has continued to increase.

Milk cows in 1955 numbered 21,044,000 and milk production was 5,842 pounds per cow. In 1969 there were 12,689,000 milk cows and milk production was 9,158 pounds per cow. In 1980 there were 10,815,000 milk cows and milk production was 11,875 pounds per cow. Pounds of beef produced per cow (average) have increased much more slowly with many ups and downs in the trend. This variation may be due primarily to the availability of adequate forage, which depends on favorable weather. Good weather with adequate rainfall may provide good production. Bad weather or drought conditions would require reducing the amount of time calves are kept on forage or forcing early sales at lighter weights. Changing weather makes it difficult to determine current changes in beef production in the Nation, but the long term trend seems to be up. See table 8.

Table 8. Number of beef cows, production and average per head

	Head of beef cows	Total production (lb.)	Average per head (lb.)
1955	25,659,000	13,213,000,000	515
1956	25,371,000	14,090,000,000	555
1957	24,534,000	13,852,000,000	565
1958	24,165,000	12,983,000,000	537
1959	25,112,000	13,233,000,000	526
1960	26,344,000	14,374,000,000	546
1961	27,102,000	14,930,000,000	551
1962	28,691,000	14,931,000,000	520
1963	30,589,000	16,049,000,000	524
1964	32,794,000	18,037,000,000	550
1965	33,400,000	18,325,000,000	535
1966	33,500,000	19,493,000,000	582
1967	33,770,000	19,991,000,000	591
1968	34,570,000	20,662,000,000	597
1969	35,490,000	20,960,000,000	590
1970	36,689,000	21,472,000,000	573
1971	37,878,000	21,697,000,000	572
1972	38,810,000	22,218,000,000	572
1973	40,932,000	21,088,000,000	515
1974	43,182,000	22,844,000,000	529
1975	45,712,000	23,671,000,000	517
1976	43,901,000	25,969,000,000	585
1977	41,443,000	25,279,000,000	603
1978	38,738,000	24,242,000,000	626
1979	37,062,000	21,446,000,000	579
1980	37,086,000	21,644,000,000	584

Question No. 7 Milk cow numbers have declined since 1960. What has happened to milk production?

Generally, over the past 50 years production per cow has increased due to improved breeds and nutrition. Also, cattle inventories have risen at almost the same rate as the human population--a desirable trend. The problem with the expansion is the cyclic periods of rapid build-up followed by difficult years of low prices and reductions of herd numbers. About 2 million more cattle and calves in the inventory each year are required to keep up with the population growth. But, increases of 5 to 6 million head a year, such as occurred in 1952, 1953, 1974, and 1975 result in an unmarketable surplus, and invariably bring about sharply lowered prices for beef cattle.

State and national cattle producers associations, vocational agriculture teachers, extension service agents, and other agricultural workers have devoted much time in their meetings and publications to the effects of supply and demand, and have sounded stern warnings of the danger in over-expansion. Cattle numbers dropped to their lowest point in 1979 and are gradually moving upward again. Only time will tell if cattle producers will try to make the increase gradual and in line with population growth or whether this will be the start of another boom and bust cycle.

The high and low extremes in beef production may be tempered by a counter-cyclic import bill which will allow import of more beef to attempt to level out the cycles. When prices are high and supplies are low, more cattle or meat is imported. When prices are low and supplies are high, less cattle or meat is allowed to be imported. Over-expansion in cattle numbers in the future, as in the past, can only lead to a price decline. In view of this pattern, farmers should avoid high cost, high risk, and speculative additions to herds. Farmers should always study the outlook and adjust their operations to improve their chances for profit.

Question No. 8 What causes the cycle of cattle numbers?

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The Demand Outlook for Beef Cattle

The demand for beef is necessarily very closely associated with supply, because beef is a perishable product. Pork can be cured and stored, but beef cannot. Small amounts are canned and frozen, but in relation to the total used they do not have a large impact. Almost all beef is consumed in a relatively short time. Of course, some beef is held in cold storage at all times to assure an adequate available supply. Storage also takes care of slaughter in excess of immediate consumption demands. The annual slaughter of cattle of all classes determines the supply of beef available for consumption. See tables 9 and 10.

The present rate of population growth and the increasing per capita consumption of beef should mean an increasing demand for beef. The population growth trend has slowed down the last few years, and if this trend should continue it will reduce the demand slightly in the future. The demand for beef naturally must come from the available supply--the annual slaughter of cattle and calves as well as the import of beef. Just as the production of beef cattle has run in cycles through the years, so has slaughter run in cycles with about the same pattern, with one exception. The slaughter cycle usually follows the production cycle from 1 to 3 years, because farmers withhold cattle from slaughter to build up their herds. This pattern is reflected in the upward trend in cattle inventories, and increasing slaughter is reflected in the downward trend of inventories.

The general economy of the country affects the price outlook for beef cattle. As stated earlier, the level of consumer income influences the consumption of beef. The higher per capita income, the higher the consumption of beef.

The idea is often advanced that the supply, demand and price of competing meats influence the supply, demand and price of beef. A study of the per capita consumption of the different kinds of meat (table 7) fails to show any definite correlation. Beef constitutes a little more than 65 percent of the total United States red meat consumption, and pork constitutes just a little less than 32 percent. Veal makes up 2 percent and lamb-mutton make up less than 1 percent. Veal and lamb-mutton make up such a small portion of total meat consumption that they certainly couldn't influence the price of beef. If any meat could be said to compete with beef in the consumer market it would certainly be pork, with chicken running third. Yet a study of beef cattle prices and

Table 9. Commercial slaughter - beef, pork and all red meat, 1940-80

Year	Total beef (Mil lbs)	Per capita (lbs)	Total pork (Mil lbs)	Per capita (lbs)	Total red meat (Mil lbs)	Per capita (lbs)
1940	6,948	52.6	8,246	62.4	16,942	128.3
1941	7,858	52.1	7,904	59.3	17,613	132.0
1942	8,592	63.7	9,234	68.4	19,910	147.6
1943	8,306	60.7	11,762	86.0	22,226	162.6
1944	8,801	63.6	11,502	83.1	22,933	165.7
1945	9,936	71.0	8,843	63.2	21,361	152.7
1946	9,010	63.7	9,234	65.3	20,519	145.1
1947	10,096	68.9	8,811	61.1	21,179	147.0
1948	8,766	59.8	8,486	58.7	19,303	131.7
1949	9,142	63.9	8,875	67.7	19,844	144.6
1950	9,248	63.4	9,397	69.2	20,363	144.6
1951	8,549	56.1	10,190	71.9	20,219	138.0
1952	9,337	62.2	10,321	72.4	21,272	146.0
1953	12,055	77.6	8,971	63.5	23,192	155.3
1954	12,601	80.1	8,932	60.0	23,805	154.7
1955	13,213	82.0	10,027	66.8	25,471	162.8
1956	14,090	85.4	10,284	67.3	26,643	166.7
1957	13,852	84.6	9,579	61.1	25,567	158.7
1958	12,983	80.5	9,618	60.2	24,378	151.6
1959	13,233	81.4	11,131	67.6	26,017	159.5
1960	14,374	85.2	10,863	65.2	27,016	161.4
1961	14,930	88.0	10,730	62.2	27,438	161.0
1962	14,931	89.1	11,229	63.8	27,891	163.6
1963	16,049	94.5	11,863	65.5	29,516	169.8
1964	18,037	99.8	12,019	76.2	31,687	185.5
1965	18,325	99.3	10,736	67.2	30,636	175.6
1966	19,493	104.0	11,130	65.7	32,124	178.5
1967	19,991	106.2	12,337	72.0	33,753	186.2
1968	20,662	109.4	12,867	73.4	34,817	190.4
1969	20,960	110.8	12,774	71.4	34,914	188.9
1970	21,472	113.7	13,248	72.7	35,818	192.6
1971	21,697	113.0	14,606	79.0	37,363	197.8
1972	22,218	116.1	13,460	71.3	36,640	192.9
1973	21,018	109.6	12,578	63.9	34,495	178.0
1974	22,844	116.8	13,583	69.1	37,323	190.5
1975	23,671	120.1	11,314	56.1	36,211	182.4
1976	25,667	127.6	12,219	58.7	39,060	192.1
1977	24,986	124.0	13,051	60.5	39,172	190.0
1978	24,010	117.9	13,209	60.3	38,119	182.7
1979	21,261	105.5	15,270	68.7	37,225	177.8
1980	21,470	103.4	16,431	73.4	38,590	180.2

Table 10. Cattle and calves: Number slaughtered under Federal inspection by classes (thousands), 1949-80

Year	Steers	Cows	Heifers	Bulls & stags	Calves
1949	7,090	4,178	1,492	462	6,449
1950	6,944	4,267	1,390	503	5,850
1951	6,180	4,008	1,190	492	4,985
1952	7,171	4,090	1,408	496	5,294
1953	9,445	5,591	2,049	545	7,013
1954	9,302	6,236	2,474	466	7,573
1955	9,229	6,656	2,674	427	7,499
1956	10,310	6,624	2,837	414	7,843
1957	10,018	6,051	2,980	404	7,324
1958	9,840	4,558	2,951	293	5,672
1959	9,681	3,836	3,701	424	4,875
1960	10,557	4,441	4,124	273	5,259
1961	11,164	4,033	4,521	250	5,005
1962	11,447	4,250	4,420	222	4,980
1963	12,496	4,157	4,807	202	4,535
1964	14,395	5,322	5,128	287	4,820
1965	13,486	6,646	6,066	415	5,076
1966	13,844	6,120	6,935	420	4,432
1967	14,681	5,540	7,174	385	4,002
1968	15,361	5,785	7,986	459	3,876
1969	15,754	5,998	8,286	499	3,637
1970	16,608	5,373	8,304	507	3,024
1971	17,003	5,627	8,229	560	2,806
1972	17,749	5,402	8,535	583	2,421
1973	16,604	5,659	7,645	613	1,808
1974	17,824	6,794	7,960	741	2,355
1975	16,071	10,420	9,416	994	3,894
1976	17,266	9,703	11,116	907	4,438
1977	17,892	9,128	10,866	832	4,696
1978	17,308	7,913	10,981	746	3,620
1979	16,258	5,546	9,112	586	2,499
1980	16,059	5,925	8,980	679	2,294

hog prices by years shows that during many years price trends are in opposite directions. For instance, during 1959 beef cattle prices were increasing while the price of hogs was decreasing. Then in 1960, cattle prices were decreasing while hog prices were increasing. Obviously, eating habits of our population have changed, with some increase in meat consumption and a corresponding decrease in the consumption of potatoes and cereal products. Beef accounted for most of the increase in the meat diet. Beef almost doubled in use from 1949 to 1977 (63.9 to 125.9 percent). Chicken also doubled in use during the same period, (25.6 to 44.9 percent).

Question No. 9

Which statement is true a.___ or b.___?
a. The lower the income the higher the consumption of beef.
b. The higher the income the higher the consumption of beef.

As long as consumer income remains at a favorable level, competing meats are unlikely to ever influence the consumption of beef or the price of beef cattle.

Rex F. Daly, Agricultural Marketing Service, USDA, in his article on Prospective Needs for Food and Fiber, in the 1958 Yearbook of Agriculture says "Consumption of meat animals was at a high level in 1956, partly because of the cyclical high in supplies of beef, and a rising consumption of poultry. Projected increases of 8 to 14 percent per person from 1956, look conservative. But assumed prices for meat animals under the assumption of high prices are about a fourth above the relatively low prices in 1956. Even the 8 percent increase over the record 166 pounds of red meat (beef, pork, and lamb) in 1956 would result in a high level of meat consumption, however. Probably more and more people will prefer beef to pork." This was based on projections to 1975.

The actual consumption in 1980 was 180.2 pounds per person; an increase of 8 percent over the 166.7 pounds in 1956.

The Available Markets for Beef Cattle

Several market outlets are available for beef cattle in every community. These include (1) country buyers or cattle dealers, (2) auction markets, (3) packing plants, (4) central markets, (5) terminal markets, (6) telephone auctions and (7) individuals buying for home consumption.

Country buyers or cattle dealers, though not as numerous as they once were, are present in nearly every

community and they make it their business to visit beef cattle producers periodically and offer to buy cattle on the farm. They are usually hustlers because that is the way they make their living.

Auction markets are within a reasonable distance of just about every beef cattle producer. Most of them hold weekly sales; some more or less often. They offer various services: some group cattle by grades; some offer transportation facilities for a reasonable charge; and some provide other services such as a veterinarian.

Packing plants provide a ready market for beef cattle at all times, and they have experienced buyers who know the value of the different grades of cattle. There are two different types of packing plants. The major packing plants serve large areas such as 20 to 30 counties or even an entire State. The small packing plants serve usually one or two counties or one city.

Central markets, as the term is used here, refers to organizations such as Union Stockyards at Jackson, Miss., or Houston Stockyards at Houston, Tex. These provide a ready market for beef cattle at all times and, in addition, some of them conduct weekly auctions.

Terminal markets are the larger markets such as those at St. Louis, Memphis and Fort Worth. Most of the cattle going to terminal markets are consigned to commission agents who represent the owner in private treaty sales. However, there are independent livestock dealers at all terminal markets who buy cattle daily.

Telephone auctions are a fairly recent type of market started about 1966-67. The cattle are left on the farm or ranch until sold. An appraiser will visit each farm, look at the cattle, make up a description, and even take pictures. The cattle are weighed on the date of sale after they are sold. Buyers then bid on the cattle by telephone conference hookup. The auction is run by the telephone auction organization. After the cattle are sold the buyer then makes arrangements to pick up the cattle. There is less weight loss and stress to the animals, the buyer gets animals in better condition, and the chance of spreading disease is less.

Question No. 10 What are three ways to market beef cattle?

a. _____

b. _____

c. _____

FACTORS THAT DETERMINE HOW BEEF CATTLE MAY FIT INTO A FARMING PROGRAM

Several factors determine how or if beef cattle may fit into an individual farmer's program: (1) interest in beef cattle, (2) land, (3) labor, (4) capital, (5) buildings and equipment (6) feed supply, and (7) market outlets. Many of these factors would determine the place of any enterprise in a farming program. The factors discussed in this chapter are taken from farm management studies and analyses of the possibilities of all farm enterprises. Farmers can use this information to select those enterprises that most efficiently employ all available resources, and return the largest possible net profit.

Interest in Beef Cattle

This factor is discussed first, although some might think it is insignificant, because one's interests are very essential for success or profit. A farmer who is not already producing beef cattle must have a natural liking for cattle, an eagerness to learn, and a willingness to work before there is any chance for much success with beef cattle.

Land

Beef cattle are primarily roughage-consuming animals--grass, hay, silage, and forage crops. Range forage is the cheapest source of feed for beef cattle, and must be the foundation of any successful beef cattle program other than a feed-lot operation. The amount of land required for forage depends upon the productivity of the land, the kinds of grasses, and the amount of fertilizer used.

The South has an advantage over other regions because of the long growing season for pasture grasses. Government cotton acreage reduction programs have removed many thousands of acres from row crop production.

Most successful cattlemen provide about 3 acres of permanent pasture per cow and calf. In Mississippi, the cattle population is about one to every 4 acres. A farmer should consider the number of acres of pasture land and its productivity to determine how beef cattle would fit into a farming program. Nearly every farm has many acres that are not adaptable to any other use except, perhaps, forest-and-pasture land.

Labor

Beef cattle require less labor than any other class of livestock--dairy cattle, hogs, or sheep--and far less labor than cultivated crops occupying an equal area of

land. Most of the labor for the beef cattle enterprise is needed during the winter and early spring when there is little other demand for labor on the farm. Beef cattle tend to distribute the labor requirements of a farm throughout the year by utilizing labor that likely would be idle during the winter, and lessening the demand for labor during the summer by using part of the cropland for hay and pasture.

Normally, one person can look after a herd of about 200 beef cattle except during periods when they have to be handled for vaccination, castration, insect control, etc. Of course, extra farm labor would be required for harvesting and storing hay, and putting in silage crops.

Capital

This discussion is confined to capital requirements for cattle because different aspects of capital requirements are involved in the other factors that determine how beef cattle will fit into a farming program.

The amount of the capital investment for cattle depends upon the type of beef cattle program involved. A purebred beef cattle program would call for the largest capital investment because purebred cattle usually cost from 100 percent upward more than grade or commercial cattle. Of course, the operator would be raising breeding stock that would sell proportionately higher. Yet, the large, initial capital investment would have to be considered and might be a determining factor.

The second largest capital investment probably would be for a feed lot operation. In this type of program high quality feeder cattle must be bought because they are the only kind that has a good possibility of finishing out to a high quality slaughter animal at a profit. This is a rather highly specialized, highly skilled program that requires considerable experience for success.

The next largest capital investment probably would be required in a buy-and-sell program. In most instances, this program consists of buying stocker cattle in the fall or early spring, and selling them as grass-fat cattle or feeders the following summer or early fall. Even though the investment might be rather large, it would have the advantage of a quick turnover of the capital.

Commercial cow-and-calf programs probably require the least amount of capital. In this program cows could be

bought at the regular market price, which during 1979 averaged from $500 to $800 each. You would need to buy a good quality purebred bull for each 20 to 30 cows, which might cost from $1,500 to $3,000. This kind of program is one that should be grown into rather than bought into. A farmer who is inexperienced with beef cattle might make a wise beginning with a commercial cow-and-calf program if a beef cattle enterprise might fit into the farming operations. Of course, anyone beginning in the cattle business would be wise to seek expert advice.

Buildings and Equipment

Very few buildings and equipment are required in most beef cattle programs. In fact, no buildings other than for feed storage are needed for beef cattle, under southern climatic conditions. Most farms already have ample feed storage.

Feed Supply

Pasture or range should furnish practically all the feed supply for about 8 months during the year. The feed supply for the remaining 4 months, sometimes more, usually consists mainly of hay or silage or other roughage. Not many farms have equipment and facilities for storing silage. Yet, with rather large herds, silage may offer one of the cheapest wintering feeds. Winter grazing crops such as ryegrass, oats or wheat in combination with hay or silage also may be used for wintering brood cows or fattening weanling calves at the rate of about 0.75 to 1 acre per animal. Experiment Station tests have shown winter grazing to be profitable for fattening good quality weanling calves.

A good rule-of-thumb to follow in figuring feed supply for wintering mature animals is to provide about 1.5 to 2 tons of hay or 3 to 4 tons of silage per head. Either of these roughages usually will have to be supplemented with 1 pound per head per day of high-protein concentrate such as soybean meal or cottonseed meal.

A purebred herd producing breeding animals for sale would naturally need more feed because meatier animals would bring a higher price. A feed-lot program might require still more feed, particularly grain and high-protein concentrates which are the most expensive feeds. A feed-lot program might require 25 to 30 bushels of corn, and 150 to 200 pounds of high protein concentrate per head.

Question No. 11

Name five of the seven factors that determine how beef cattle may fit into a farming program.

a. _____
b. _____
c. _____
d. _____
e. _____

CHOOSING A BEEF CATTLE PRODUCTION PROGRAM

We will consider four types of beef cattle production programs: (1) the purebred program, (2) the commercial cow-calf program, (3) the finishing or fattening program, and (4) the buy-and-sell, or stocker-feeder program. Variations in each of these programs might allow some adaptations to an overall farming operation. Yet, each type of program has rather specific requirements which will be treated separately on the following pages.

A farmer's choice of a type of beef cattle production program depends on the individual situation and resources. A careful analysis of the factors should help decide which type of beef cattle production program might best fit into the farming operation.

A combination of two or more types of beef cattle production programs may be more profitable and best adapted to certain situations. For instance, on a large farm with plenty of pasture or range and considerable production of feed grains, a commercial cow-calf program might provide a desirable supply of Good to Choice grade, feeder calves for finishing out in a feed lot on a farm and greatly increase the profit from the enterprise.

You must consider all aspects of each type of program as they might relate to available resources and other farming operations before making a decision.

A Purebred Program

Purebreds involve a highly specialized program. More skill, knowledge, and patience are probably required for success in the purebred program than in any other type of beef cattle production. A purebred operator must know the type of cattle that is in demand and must be skilled in choosing herd replacements or buying foundation breeding animals. The operator must keep in mind the kind of cattle that will make money for the breeder, the feeder, and the commercial cattle producer and the type that will produce the kind of carcass that will satisfy the consumer.

The objective of a purebred program may be two-fold: (1) to breed superior animals for foundation stock for other purebred breeders and thus make a lasting contribution to the general improvement of the breed, or (2) to produce good purebred bulls for commercial cow-calf operators and females for beginning purebred breeders. Very few purebred breeders ever accomplish the first objective because they lack the money, time, and the skill. Those who do succeed are often called master breeders.

The purebred program requires much more capital than any other type of beef cattle production. The initial cost of foundation stock may be high. Production costs of purebreds are always higher than for grade or commercial cattle. The purebred breeder, to be successful, must keep the herd in a meaty condition the year round. This standard is necessary to rapidly develop young stock and keep the entire herd in an appearance that appeals to prospective buyers. Hence, more and higher quality feed is required.

More labor is required in a purebred program. The animals are usually hand mated because accurate breeding records are essential for registration. The bull and heifer calves must be separated at an early age. All the animals are valuable and usually require more or less individual feeding and care. The entire premises must be kept neat and clean at all times. Most breeders consider it good advertising and advantageous to fit and groom a string of show animals to take on the circuit of district livestock shows and fairs. This requires additional labor and feed, and is expensive. Nurse cows are often used for calves that are to be shown so that they may be developed most rapidly.

Question No. 12 What are the objectives of a purebred program?

a. _____

b. _____

Usually, a greater investment in buildings and equipment is required in a purebred program, although elaborate buildings and equipment are not necessary. Many purebred breeders have fancy barns, painted board fences and other features that tend to create a show place that will attract prospective buyers.

The land required for a purebred program might be compared to that of a commercial cow-calf program.

Pasture should be the key to the feeding program with the cow herd, and a little more acreage might be required to assure maximum growth and development of the calves. Sometimes it is even necessary to feed the cows a small amount of grain while they are on pasture. High-priced or high-yielding land has no place in a commercial cow-calf operation. However, this rule may not apply to a purebred program because the cash returns may possibly be much greater.

Marketing costs for purebred cattle are generally higher than those for commercial grades of cattle. Established markets, as in the case of commercial cattle, are not available, thus forcing the breeder to find a market. Many of the larger breeders have annual production sales, publish their own catalogs, etc., which make the sales rather expensive.

Various kinds of advertising through livestock shows, livestock journals, magazines, highway billboards, and other media are often necessary to help the breeder sell purebreds to advantage.

An expense that is often overlooked in the purebred program is the depreciation of the breeding stock. This item may be almost disregarded in the financial aspect of most other beef cattle production programs because all the animals are sold for beef. However, in the case of purebreds, depreciation is of considerable importance because breeding animals bought at high prices eventually have to be sold for beef at regular market prices. High losses to some individual breeders have erased the profits from an entire year's operation. Depreciation losses are particularly heavy during periods of financial depression when prices are rapidly declining.

The percent calf crop weaned annually is generally considered the most important factor in determining profit or loss in any breeding program, whether purebred or grade cattle. Successful purebred breeders cull strictly to offer only good quality breeding animals for sale and to maintain their reputation. To maintain this standard many of the bull calves each year are castrated and sold for beef. Hence, the purebred breeder incurs greater losses from low percentage calf crops than does the commercial cow-calf operator. In a purebred program the annual calf crop must be kept close to 100 percent.

Ranchers in the West, where beef cattle are the principal source of farm income, have long recognized the value of good breeding and have been willing to pay

premium prices for good breeding stock. However, farmers in the South have been slower to recognize the value of superior breeding animals, particularly bulls. Too often they have not been willing to pay much more, if any more, for a good purebred bull than the value of the animal for slaughter.

For many years most of the top quality breeding animals had to be purchased elsewhere, because only a few were available in the South. This situation has changed, however, in recent years and there are now several outstanding breeders of purebred cattle of all the major beef breeds in various parts of the South.

Question No. 13 Should you depreciate your breeding stock in a purebred program? Yes____ No____

Question No. 14 What type of market does a purebred breeder use?_____

Data are not available to compare costs and returns from a purebred program with other types of beef cattle production programs. Too many different situations are involved for such information to be of appreciable value to the present or prospective beef cattle producer who must choose a beef cattle program. The capital investment in foundation animals in a purebred program varies considerably, much to the choosing of the breeder, with no reasonable ceiling. The price purebred breeder might expect to receive for their sale cattle would depend on many factors, such as the actual and recognized quality of the animals, the demand, the price of slaughter cattle, the general economy, and other factors. There is an old saying among commercial cattlemen, "You can afford to pay as much for a good quality registered bull as three good slaughter-grade steers will bring on the market". Then, too, there is a saying among purebred breeders, "A good steer is worth more than a poor quality registered bull." In other words, the fact that an animal is purebred and registered does not determine its value or sale price.

Purebred prices are affected by many factors. Prices vary greatly between breeders due to differences in the popularity of blood lines in their breeding, as well as differences in the quality of individual cattle.

On a rising slaughter cattle market, purebred cattle prices may become speculative and not at all related to

slaughter cattle prices. During periods of a stable or a declining slaughter cattle market, purebred cattle prices follow the trend of the price of slaughter cattle very closely. Price fluctuations have bankrupted many cattle speculators, who have attempted to buy into the business during periods of high prices. But the breeder who "grows as he goes", with a herd from a foundation of a few carefully selected animals of high quality will not be as likely to fail as the breeder who buys into the business.

Purebred breeders who closely study price trends of slaughter cattle will gain valuable information. These trends are one of the better indicators of prospective demand for purebred cattle. They also serve as a guide to the price breeders may expect to receive for their bulls and heifers. The price trends of slaughter cattle also affect the disposable income of commercial cattle producers.

Seasonal price fluctuations also are important. Purebred cattle seem to bring higher prices in late winter and early spring. There are several reasons for this: (1) it is just before the breeding season, (2) district cattle shows are held during this time, (3) a greater number of production sales and consignment sales are held during this period, and (4) more superior animals are offered for sale.

We might summarize the possibilities of a purebred program as follows:

a. It is a highly specialized business.

b. It requires large investment capital.

c. More labor is required in a purebred program than any other program.

d. Usually more expensive buildings and equipment are required.

e. Keen business judgement is necessary for success.

f. A thorough knowledge of all phases of beef cattle management is essential.

g. It is a long-time program. Breeders establish a reputation for the quality of cattle they are breeding only over a period of many years. Experience is highly valuable in a purebred program.

h. Returns on the investment come slowly.

i. There is a considerable element of risk. Not nearly all the cattle raised will be desirable breeding animals, and those that aren't must be sold at slaughter prices. Depreciation is high on valuable foundation stock.

j. It requires expert skill in buying and selling breeding animals.

k. Land resource requirements are higher than for most other types of programs. Plenty of good pasture forage is essential. The production of stored roughages and grain is highly desirable.

l. Only a few purebred breeders ever become master breeders.

A Commercial Cow-Calf Program

The objective of this type of beef production program is to produce a good calf crop which is usually sold at the end of the grazing season each year as stockers or feeders or as milk-fat slaughter calves. The program usually consists of a grade-cow herd with good purebred bulls. In this program the calves run with the cows until they are weaned or sold, and none of the cows are milked. More than 90 percent of the beef cattle production programs in the South are commercial cow-calf operations.

This type of program is most extensively used throughout the South and the range country of the West. The main reason this program is so widespread is because it is especially adaptable to regions where pasture or range is plentiful and land is relatively cheap. The cow herd is maintained on pasture and cheap roughage, and needs very little if any expensive feeds even for wintering. There is an abundance of land in this area that, because of erosion and leaching, would be unprofitable for row-crop farming, but may produce good pastures. Also, there are many thousands of acres that are of such rough topography that they are suited only for the production of grasses or trees. Therefore, it is only natural that the cow-calf type of beef production program is most commonly practiced in the South.

The commercial cow-calf program requires more land resources than any other type of beef cattle production, with the possible exception of the purebred program. Successful cattlemen provide about 3 acres of permanent

pasture for each cow and her calf. This acreage includes much grazing land that is rather unproductive and does not receive good management. Less acreage per cow would be required when it consists of a good balance between legumes and grasses, and a fertilization program is carried out. Conversely, more acreage per cow would be required if wooded areas, gullies, and barren, eroded areas make up any considerable portion of the grazing land. Remember that the cow-calf program is essentially a grazing enterprise. Pasture or range should furnish all the feed for the cow herd for approximately 8 months of the year, maybe longer.

Probably one of the biggest weaknesses in most beef cattle operations in the South is over-stocking or over-grazing permanent pastures. Farmers are always inclined to expect average or above average rainfall during the summer and early fall months to provide good growth of forage. Yet, weather records show that nearly every year we have drought periods of varying intensity, sometimes so severe as to "burn" pastures. Grasses that are grazed down to the ground recover slowly when moisture does become available. When grazing is scarce, the cows do not get sufficient nutrients to produce enough milk to raise good calves.

Question No. 15 Why is the commercial cow-calf program the most extensive in the South?

Harvested roughage is needed for wintering the cow herd. A good rule-of-thumb is to provide about 1.5 tons of hay, or the equivalent in silage--about 4 tons--per cow. A better option would provide 3 tons of silage and about 0.5 ton of good legume hay per cow. Many successful beef cattle producers harvest hay from the surplus pasture growth in early summer and stack it in the pasture where the cows can eat it at will during the winter. Another practice which helps reduce the expense of wintering the brood cows is to keep them off part of the pasture so that it will make a good growth in late summer. Thus, they are provided with a supply of "frosted" grass on which to graze during the winter. Of course, as this dead grass weathers it becomes less and less nutritious.

In addition to the roughage, the cow herd may need about 1 pound of cottonseed meal or soybean meal per

head per day during the winter. The need for this supplement will depend largely on the quality of the roughage, and whether the cows are nursing calves.

The capital requirement in a cow-calf program is relatively large because of the investment in the breeding herd. The commercial cow-calf program is of a long-time nature and if capital is not readily available the program would require long-term financing. Too, this type of program is rather inflexible and does not lend itself to adjustments up and down with market conditions or price cycles. There are few "in and outers" in this type of beef cattle production program.

The labor requirements for a cow-calf program are more than in a buy-and-sell program, but usually less than in any other type of beef cattle operation. The size of the operation is usually planned so that the family or regular farm labor can handle it. This requirement accounts for the fact that many of the smaller farms often have a small cow herd--a one-bull unit--to supplement the income from other productive enterprises such as cotton, soybeans, etc. In fact, a cow-calf operation usually provides for better distribution and use of farm and family labor.

The possibility for profit from a commercial cow-calf program probably depends more on the percent calf crop each year than any other factor. The sales from calves provide the only source of income other than sales of culled cows, which is usually not very much. The calves must pay all the operating expenses: feed for wintering the cow herd, interest on the capital investment, services of the bull, pasture costs, cow herd replacements, veterinary expenses, and other miscellaneous items. Various experiment station reports indicate that the productive life of a cow is from 5 to 8 years; thus, an operator would need to save enough top heifer calves for replacements each year to equal about 15 to 20 percent of the calf crop. The average, annual cow-cost varies from farm to farm and from year to year. Even with good management a calf crop over 90 percent can hardly be expected.

The quality of the cow herd and their calves also influences the possible profit from a commercial cow-calf program. Many of the smaller herds consist of native or grade cows with considerable dairy breeding in them and are mated with a good beef type bull. Those cows give much more milk than high grade beef cows and hence produce a more rapid-gaining calf

and usually a heavier calf at weaning. However, these calves must be sold as milk-fat slaughter calves before they lose their "bloom" from milk. They do not perform well in the feed lot, and the older they get the more their dairy breeding and lack of beef type conformation shows up. These calves are often referred to as "one-way" calves because they are not suitable for feeders.

On the other hand, if the cow herd consists of high-grade cows of beef breeding, and they are mated with a good beef type bull, their calves may be sold as feeders, or as fat slaughter calves at weaning time. This is because the calves would have that good beef type conformation that is essential for them to put on rapid gains in the feed lot. Feeders usually prefer to buy feeder calves that grade Choice and will not buy any that grade lower than Good. Whether it would be desirable to sell the calves for slaughter at weaning would more than likely be determined by the milking ability of the cows. Calves from this kind of commercial cow-calf program are often referred to as "two-way" calves. This type of operation is desirable because it provides the farmer a choice of fattening the calves out as "baby beef"; or roughing them through the winter, grazing them through the summer and selling them at a much heavier weight as yearling feeders the next fall, or selling them as slaughter calves at weaning.

Question No. 16 Why is the percent calf crop important to a commercial cow-calf program?

Actually, there are many variations of the cow-calf program. The Mississippi Agricultural Experiment Station conducted a test in 1956 to determine which of 14 methods of beef production in the cow-calf program would be most profitable for two levels of pasture improvement. The two levels of pasture improvement considered were (1) native pastures and (2) pastures improved to the average level of all pastures found improved in a recent survey of the Prairie Area of the State. The methods of production were classified on the following basis: (1) spring or fall calving, (2) age at which calves were marketed, (3) type of winter ration, and (4) whether calves received concentrate feeding in addition to permanent pasture prior to marketing.

Selling spring calves at weaning was the least profitable of any of the 14 alternatives studied for both levels of pasture improvement. However, net returns

from pasture improvement depend upon the manner in which the forage is used. The proportion of the total grazing used, which is required for the brood herd and replacements, appears to be one of the primary factors influencing profits from the beef enterprise. About 90 percent of the total grazing is required for the brood herd and replacements when calves are sold at weaning. In contrast, for the four most profitable alternatives the percentage ranged from 66 to 74.

The four most profitable methods of handling cow-calf beef herds at both levels of pasture improvement were:

1. Roughing spring calves through the first winter and feeding out on permanent pasture the next summer.

2. Roughing spring calves through the first winter and grazing permanent pasture the next summer.

3. Grazing spring calves on temporary winter pasture and selling at end of spring grazing season.

4. Grazing spring calves on temporary winter pasture and feeding out on permanent pasture the next summer.

In summary, several advantages of a commercial cow-calf operation include:

1. There is less risk of losing money because of rapidly declining prices.

2. This program provides the best chance to make money from poor to average pasture land and low-grade roughages.

3. A cow herd usually increases in value because of the upgraded replacement stock that is sired by a good bull.

4. The cow-calf program fits into many types of farming operations to best use the equipment and labor supply on the farm.

5. Ihe program is of a more permanent nature than most types of beef cattle production, and is usually a dependable source of income over the years.

6. The program may be used as a supplemental source of farm income or it may be the only cash enterprise on the farm.

7. If the farm produces a lot of grain the cow-calf program might provide a better source of healthy feeder cattle than could be bought, and the grain might be more profitably marketed.

8. You can grow into this kind of program.

The commercial cow-calf program also has disadvantages which must be considered in deciding what type of beef cattle production to follow:

1. This program is a long-time operation that requires a high capital investment in cows. Three to four years are required before you can expect any returns from replacement stock that you raise.

2. A high level of management is needed because the program includes all the problems and experiences of the beef cattle enterprise except fattening on feed for slaughter.

3. The program follows a rigid operation. Adjustments cannot be readily made in the size of the operation or management when faced with a sharp price change, or unfavorable weather conditions.

4. Death losses are probably higher in this type program.

A Finishing or Fattening Program

Finishing or fattening cattle means the laying on of fat. The purpose of the fattening process is to produce a carcass that meets consumer demand. Fat gives beef its distinctive flavor. Fat interspersed throughout the lean meat improves its quality and increases its tenderness. This condition is referred to as "marbling". Fat also adds to the digestibility and nutritive value of beef.

Two general methods of fattening cattle for market are: (1) pasture fattening, and (2) dry lot fattening. In either case, you will usually feed high-carbohydrate feeds such as farm grains to put sufficient fat on cattle to meet the market demands. You will probably supplement farm grains with a protein concentrate--soybean meal or cottonseed meal--unless a high quality legume hay or high quality grazing is provided. Of course, you may fatten cattle on grass alone to an acceptable degree of finish when grazing is abundant and of good quality, but this is seldom the situation.

The consumer demand for high quality beef has greatly increased in recent years. As a result, more and more cattle are being grain fed in dry lot. Because corn is

the major farm feed grain, most of the cattle that are finished for market are fed out in the Corn Belt. See tables 11 and 12.

Question No. 17 If you had a farm with a considerable amount of land that could produce good quality farm grains, and a small amount of open pasture land, what type of livestock program would be best?

Question No. 18 If you had a farm with a lot of rough land that was not suitable for row-crop production and very little labor to work the farm, what type of livestock program would be best?

Table 11. Number of cattle and calves on feed

Year	Number (thousands)	Year	Number (thousands)
1945	4,411	1962	8,520
1946	4,211	1963	9,702
1947	4,322	1964	9,845
1948	3,821	1965	9,979
1949	4,540	1966	10,582
1950	4,390	1967	11,268
1951	4,534	1968	11,417
1952	4,961	1969	12,534
1953	5,762	1970	13,190
1954	5,370	1971	12,770
1955	5,795	1972	13,912
1956	5,929	1973	14,432
1957	6,122	1974	13,643
1958	5,898	1975	10,170
1959	6,601	1976	12,941
1960	7,535	1977	12,580
1961	8,008	1978	13,450

Table 12. Number of cattle and calves on feed, by States

State	Year						
	1955-59 Average	1959-63 Average		1/1/75	1/1/76	1/1/77	1/1/78
	thousands						
North Central States							
IL	646	715		500	630	620	650
IN	243	204		250	285	290	315
IA	1,281	1,554		1,200	1,530	1,520	1,690
KS	190	313		920	1,340	1,315	1,400
MI	104	132		200	210	215	200
MN	359	446		380	430	340	400
MO	256	271		200	260	255	220
NB	589	749		1,160	1,390	1,580	1,700
ND	102	140		36	36	35	33
OH	193	207		290	320	325	295
SD	239	293		345	365	370	365
WI	111	122		135	136	130	130
		5,146	65%				7,398 55%
Western States							
AZ	199	291		319	510	361	422
CA	482	735		688	956	812	845
CO	302	419		755	925	915	1,020
ID	128	137		185	203	248	249
NV	28	27		36	25	19	12
NM	40	62		135	185	163	206
OR	56	70		65	79	88	98
MT	67	72		79	80	83	81
UT	59	71		52	60	60	62
WA	69	116		135	168	176	172
WY	36	51		38	39	55	60
		2,051	26%				3,227 24%
Southern States							
OK	58	73		232	286	305	360
TX	148	292		1,327	1,882	1,710	1,850
AL	-	*38		42	45	44	40
AR	-	-		21	21	24	25
FL	-	*67		60	81	73	72
GA	-	*66		68	80	84	101
KY	-	*50		37	35	40	50
LA	-	-		10	12	15	14
MS	-	*24		10	14	14	12
NC	-	-		45	46	50	40
SC	-	-		26	34	30	31
TN	-	-		10	16	18	20
VA	-	-		31	40	45	50
		610	7%				2,665 20%
Other States							
HI	-	-		11	16	15	14
MD	-	-		22	26	22	21
NJ	-	-		5	3	3	4
NY	-	-		10	9	10	11
PA	82	84		83	90	92	98
WV	-	-		11	11	9	10
	-	-		3	3	2	2
		84	1%				160 1%
		7,891					13,450

*1963 only.

Although most of the cattle that are finished for market are fed out in the Corn Belt, there has been a major shift to other areas:

State	1959-63		1978	
	%	number	%	number
North Central (Corn Belt)	65	5,146,000	55	7,389,000
West (except Texas, Okla.)	26	2,051,000	24	3,227,000
South	7	610,000	20	2,665,000
All others	1	--	1	--

Even though more cattle were fed in 1978 than in 1959-63 in the North Central and Western States, their percentages declined. In contrast, both the percentages and numbers increased dramatically in the South. See table 12.

Historically, very little cattle feeding has been done in the South because the cattle were of too poor quality to be profitable in the feed lot. This situation has changed in the past few years and now good quality feeder calves are sold in special auction sales every year. They are shipped or trucked to the Corn Belt or to feed lots in the South for finishing. Also, more feed is being produced in the South and more feed is being trucked in.

There are many variations or systems of fattening cattle for the market, regardless of whether the pasture feeding method or the dry-lot method is used. One's choice would be influenced by the age, size and quality of cattle; the kind and amount of feeds--concentrates and roughages--available; the length of feeding period; the amount of capital available; the amount of pasture and forage crops available; labor available; and the experience and managerial ability of the individual farmer.

A Buy-and-Sell Program

The buy-and-sell beef cattle production program involves an operation in which a farmer buys cattle and manages them to get as much gain as possible in weight through growth and development at the lowest possible feed cost. This type of program is often called a stocker-feeder operation. It is best adapted to farming situations where cheap roughage and pasture are abundant. Very little grain or other feed concentrates are fed. Operating capital, credit, and the labor supply are limited.

This program is very flexible. It may consist of buying choice calves or yearlings in the fall, roughing them through the winter, and selling them at the end of the following summer grazing season as feeders. The cattle may be roughed through the winter by using stalk and stubble fields, and feeding roughage, such as silage or grass hay, with little or no grain or other food concentrates. A full year may elapse before there is a turnover of the capital investment.

A buy-and-sell program may consist of buying thin yearlings in the spring, grazing them on permanent pasture, and selling them at the end of the grazing season in the fall as feeders. This system permits a turnover of the operating capital in 5 to 8 months.

This program requires a good knowledge of cattle because thin animals may be unhealthy. Only thrifty, healthy cattle provide any opportunity for profit. Skill is also required to buy cattle that will gain over 200 to 400 pounds per animal, depending on the length of the program and the quality of the pasture and roughage fed. Stocker cattle are usually cheaper in the fall than in the spring. Yet, they may often weigh less in the spring, so the capital investment wouldn't vary much.

Only young cattle, calves and yearlings fit into a buy-and-sell program because they are growing. The feeding program provides normal development with accompanying gain in weight without trying to put on additional finish. The rate of growth--gain in weight--decreases as the age of the cattle increases. Therefore, cattle over 2 years old are not very well adapted to the buy-and-sell program because they have just about reached maturity in size. Calves grow fastest, but they require higher quality feeds and more protein than older cattle. Their digestive system has not developed enough to use coarse, poor quality roughages in sufficient quantity to meet their nutritive requirements. Yearling cattle can efficiently use large quantities of roughages, enough to meet their nutritive requirements from roughage alone if it is of fair quality, such as mixed legume-grass hay or silage.

Most calves need from 0.5 to 1 pound of protein concentrate, soybean meal or cottonseed meal to supplement their daily ration of roughage during the wintering period for normal growth. Gain in weight at the rate of 0.75 to 1.25 pounds per day during the wintering period should provide for normal development of a calf.

Yearling cattle consume larger quantities of roughages and can digest poorer quality roughages than do calves. Yearlings can often get enough nutrients from roughages alone to meet their requirements for maintenance and normal growth during the wintering period. The adequacy of such a diet depends on the amount and quality of the roughage. Silage, mixed grass-legume hay, or a combination of them usually will provide a satisfactory wintering ration without any protein concentrate supplement. If roughage is of very poor quality, such as oat straw, supplement the ration with grain or a protein concentrate such as soybean meal or cottonseed meal at the rate of about 1 pound per day.

Permanent pasture is usually the key to success in a buy-and-sell program. A continuous supply of good pasture grasses and clovers during the entire summer grazing season will usually supply the nutritive requirements for good growth and development. The rate of gain on good summer pasture should average from 1 to 1.75 pounds per day, depending on the age of the cattle and the rate of gain during the wintering period. The less gain made by young cattle during the wintering period, the more they will gain on summer pasture, and vice versa. However, winter and summer gains are not exactly inversely proportional. They will vary from year to year and between different groups of cattle.

Cattle should not be wintered on such a skimpy ration that they will lose weight and be stunted. The wintering ration must be sufficient to provide for normal growth and development if the buy-and-sell operation is to be profitable. Nevertheless good summer pasture produces the cheapest possible gains.

The standards for wintering beef calves and for wintering yearling cattle provide sufficient nutrients to produce the indicated rates of gain. These standards provide more nutrients than for "roughing cattle through the winter" as used in this discussion. The level of nutrition indicated by the feeding standards no doubt is desirable, but it most likely would be too expensive in an average stocker-feeder operation.

Remember, the primary objective of the buy-and-sell program is to get optimum growth and development of the cattle at the least possible cost.

Question No. 19 What type of cattle are purchased in a buy-and-sell program?_____

_____

Many breeds of animals have been developed to serve various purposes. Typiness is defined as an ideal combination of physical characteristics that contribute to an animal's usefulness for a specific purpose. There are several distinct types of animals within a species of livestock.

Beef Type

An ideal beef type of animal should be thick and deep bodied, low set, and should have well placed legs with ample bone to support the animal. The back should be wide and the ribs close together. The loin should be wide, long, and well covered with flesh. The width of body should be uniform along the entire top line. The rump should be wide, long, smooth, and deeply fleshed. The rear quarters should be well developed and should be deep and full in the twist--especially wide and bulging in the lower quarter. The body is rectangular. See figure 3.

Dairy Type

The dairy type is an upstanding, lean, wedge-shaped animal bred to produce milk efficiently. The dairy type should have the temperament that causes it to use its feed almost exclusively to produce milk and butterfat at a sacrifice of body flesh. See figure 3.

Dual-Purpose Type

This type describes an animal with characteristics of both dairy and beef types. The dual-purpose type is not as lean, angular and upstanding as the dairy type, but not as blocky, thick, and as low set as the beef type. The ideal is somewhat midway between the ideals for the other two types.

Major Breeds

Cattle producers must select a breed that fits the type of animal that they wish to produce. The major cattle breeds in the United States, by type, include:

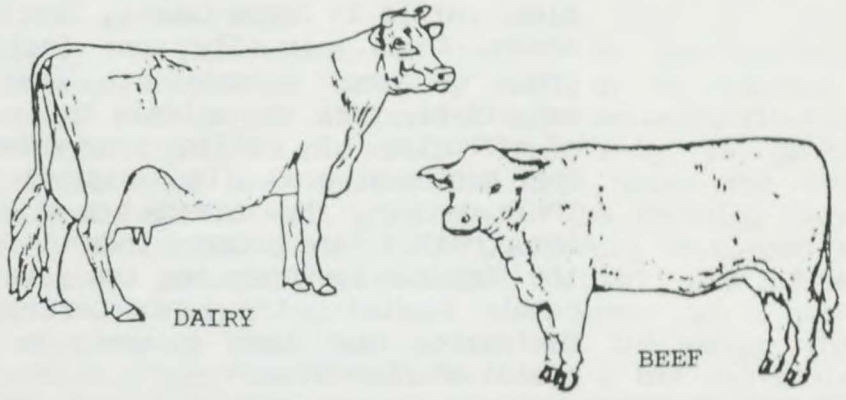

Figure 3.--Body conformation of beef and dairy cattle.

Beef Type	Dairy Type	Dual-Purpose Type
Aberdeen angus	Ayrshire	Devon
Barzona	Brown Swiss	Milking Shorthorn
Beefmaster	Dutch Belted	Red Poll
Brahman	Guernsey	
Brangus	Holstein	
Charolais	Jersey	
Charbray	Red Danish	
Galloway		
Hereford		
Polled Hereford		
Polled Shorthorn		
Red Angus		
Santa Gertrudis		
Scotch Highland		
Shorthorn		
Simmental		

A breed is a group of animals having a common origin and characteristics that distinguish them from other groups within the same species. These characteristics are passed from one generation to the next and are called inherited traits. These traits include color, milk production, horns, and many other important economic factors. Each breed of livestock has its own breed association that maintains records of the animals in the breed. An animal is said to be registered if its parents are registered in the breed's recordbook and its owner has registered it. Registration forms usually show the animal's pedigree (or family tree), a drawing of the animal, and the registration number assigned to the animal. This number is usually tattooed in the animal's ear to provide permanent identification of the animal.

Most breeds of livestock originated from one man's work with each breed, for example, Hugh Watson bred black cattle in Angus County, Scotland to produce the modern Angus. Usually some individual gathered a group of local animals and, over several decades, selectively bred the animals to produce a given type of offspring. By culling poor animals from the herd, the breeders gradually produced animals that met their desires. New breeds are still being introduced through this same process today. During this century the American Landrace hog and several breeds of beef cattle including the Santa Gertrudis, Charbray, and Beefmaster have been accepted by producers as new breeds of livestock.

When cattle producers think of selecting foundation

stock for a beef herd, they must first consider selecting a breed of beef cattle. After a breed has been selected, choices must be made for blood lines, the breeder from whom foundation stock is to be bought, and individual animals for the herd. A bloodline refers to a family within a breed, or as a sort of breed within a breed. All bloodlines date back to a common ancestor that was judged to be an outstanding individual of the breed. Selecting a breed is important, but not as important as selecting the individual animals for foundation stock or replacements. The major breeds have different breed characteristics, but may vary little in real efficiency if given equal opportunities in the beef herd.

Although selecting a breed of beef cattle is not as important as selecting individual animals, the selection of a breed for an individual herd is very important. Several factors should be considered in selecting a specific breed of beef cattle for an individual herd: characteristics of the breed, prominence of the breed in the area, personal preference, and environmental conditions under which the animals will be raised.

Question No. 20 What is meant by dual-purpose type of cattle?

Question No. 21 Name some of the traits that can be inherited from parents by offspring.

A brief description of the characteristics of the breeds, their history, conformation, color, size, etc., follow:

Aberdeen Angus

History - This breed is native to northeastern Scotland where the land is high or mountainous. Because the country is favored with well-distributed rainfall, pastures do well. Not only is grass plentiful but the country is also noted for its temperate climate and good crops. In founding this breed of cattle the Scottish breeders developed a low set, compact, thick-meated animal with fine bone. The Angus has always been known as a good grazer and an excellent feeder. On the range, the Aberdeen Angus have a tendency to be a bit excitable and wild, but with proper handling they become as quiet as other breeds.

Conformation - The heads of Aberdeen Angus cattle are

small and naturally polled. The body is somewhat more cylindrical than that of the Hereford or Shorthorn. Compactness, smoothness and symmetry are some strong points of the Aberdeen-Angus. This breed matures early. Consequently the cattle can be marketed, if the producer desires, at an early age. The records of the International Livestock Exposition show that the Angus is one of the best breeds in producing high quality carcasses, and has won more fat steer championships than any other breed.

Angus cattle are noted for their performance in the feed lot rather than on the range or pasture. Aberdeen Angus cows generally have better milking ability than Herefords and are considered good mothers, producing rapid growth and bloom in their calves. Angus cattle are usually not troubled with bad cases of pink eye and cancer eye as much as are cattle with white around the eyes. Some farmers criticize Angus bulls for not trailing cows in heat as closely as do the bulls of other prominent beef breeds, where bulls run in the pasture with the herd.

The Aberdeen-Angus bulls are considered very prepotent and fix their characteristics on their offspring to a marked degree. For example, the bull will dehorn 100 percent of his calf crop.

Color - The animal should be entirely black. Often, white spots appear on the underline behind the navel or on the udder, and these are permissible, though undesirable. A white scrotum is objectionable. White sock, white ankles, a white switch, or white spots any where else, except as noted, disqualify for show or registry.

Size - Aberdeen-Angus cattle are not among the largest breeds of beef cattle; mature bulls in well-fitted condition weigh from 1,750 to 2,000 pounds, and mature cows weigh about 1,400 pounds. Lack of size has often been advanced as a criticism of the breed.

Devon

History - This breed is native to southwestern England in the counties of Devon and Somerset. The land is rough and hilly, and better suited to grazing than tillage, even though the soil is fertile. The climate is damp and chilly. Devon rank among the oldest breeds in existence. The earliest English records show the prevalence of cattle in Devon of a color and type indicative of the modern Devon. The early improvers of the Devon were Francis, William and Henry Quartly, along with John and William Davy.

Edward Winslow introduced Devon cattle to the Plymouth Colony in North America in 1623. He brought a bull and three heifers on the vessel Charity. Beginning about 1800, numerous Devon were imported not only in New England, but also in Florida and all through the South. The Devon is considered a dual-purpose breed, and is most numerous in the South, especially in Texas, Misssissippi, Louisiana, Florida and Alabama.

Conformation - This breed is of medium size and it inclines more to the beef type than do the other dual-purpose breeds. The breed is fairly close coupled, compact, smooth, level in the rump, and ranks high in quality. Although the breed grows and finshes somewhat slower than the beef breeds, it produces meat of a fine texture and good quality. The cows are good milkers. Some producers claim that the Devon can produce young, milk-fat baby beef off grass.

Color - The breed is generally red, varying from a rich, deep red to a light red or chestnut color. The desirable color is a bright, rich, ruby red--this accounts for the nickname, "Rubies". The horns are creamy white with dark tips. There are polled Devon, also.

Question No. 22 In what country was the Aberdeen-Angus developed?

_____

Question No. 23 Name five strong points of the Aberdeen-Angus breed.

a. _____ d. _____

b. _____ e. _____

c. _____

Question No. 24 Aberdeen-Angus cows are better milkers than Herefords.

Yes_____ No_____

Question No. 25 Out of 25 calves born from an Aberdeen-Angus bull and Hereford horned cows, how many will have horns?

25___, 15___, 5___, 0___.

Question No. 26 Aberdeen-Angus cattle are usually not troubled with bad cases of _____ and _____ as much as are cattle with white around the eye.

Question No. 27 Give two criticisms of Aberdeen-Angus cattle.

a. _____

b. _____

_____

Hereford

History - This breed is native to Herefordshire, England. Early breeders selected large animals having good grazing ability. When this breed was founded, Hereford steers were known as the greatest draft animals of that country. The first Herefords were imported to this country in 1817 by Henry Clay of Fayette County, Kentucky. Some years later, Herefords were imported to the United States in large numbers and the American breeders selected animals of a smaller type with more symmetry, thickness and smoothness, and capable of carrying more meat. The Hereford is, by far, the most popular breed of beef cattle in the United States.

Conformation - The Hereford has been bred strictly for beef production. Therefore, it is deeply fleshed, closely coupled, thick-bodied and close to the ground. Breeders have not tried to produce good milking Herefords. Cows of this breed produce just about enough milk to raise their own calves. The Hereford is the most popular breed of cattle in the range country because it is a good forager and can withstand the rigorous conditions of the range country. This breed is the equal of any other for the production of baby beef or heavy steers.

Color - Herefords are red and white. The face and the top of the neck, the breast and underline, bush of the tail and the legs below the knees and hocks are white. The body is red, and may vary from a very dark red to a light yellowish-red cast. The Hereford is often called the White-Face breed.

Herefords have a longer and more curly coat of hair than most other breeds. They also have a thicker hide than the Shorthorn or Aberdeen-Angus. These characteristics are of special value in withstanding winter weather on the range.

Size - Hereford cattle are among the largest breeds. Mature bulls in wellfitted condition weigh 1,800 to 2,250 pounds; cows weigh 1,200 to 1,600 pounds.

Polled Hereford

The Polled Hereford was developed in the United States, primarily by selecting and breeding polled sports that occurred in the Hereford breed.

The American Polled Hereford Association refers to the Polled Hereford as the "modern Hereford minus horns". Breeders of Polled Herefords emphasize the same compact, deep-bodied, thick-fleshed cattle that have made the Hereford popular. They have desired to breed exactly the same type of cattle, but without

horns. Not only have Polled Herefords become popular in the United States, but they have also been exported to many foreign countries.

The Polled Hereford breed was developed by Warren Gammon of Des Moines, Iowa in 1900. He wrote to all the members of the American Hereford Association asking if they had any cattle that were naturally polled. He located 10 cows and four bulls. In form and other characteristics, the Polled Herefords closely resemble the Herefords.

Question No. 28

What is the most popular breed of range cattle in the United States and what is its home of origin?

a. _____

b. _____

Question No. 29

Herefords are _____ milk producers, but are popular in the range country because they are good foragers and have the ability to withstand rigorous conditions on the range because of _____

_____

_____

Shorthorn

History - This breed was developed in northeastern England, and it has been a popular breed in its native country ever since. Some Shorthorn cattle were imported to the United States as early as 1783, but the breeding and disposition of those early cattle is not known. The most reliable records show that Shorthorns were imported to Kentucky in 1817. Kentucky and Ohio took the lead in developing this breed of cattle and in 1882 the American Shorthorn Breeders Association was established.

Conformation - The Shorthorn has a broad back, wide loin, and wide rump. Most Shorthorns are broad, squarely built, possess a deep body, and carry down well in the hind quarters. The Shorthorn's body is probably more rectangular than that of the other breeds of beef cattle. The beef Shorthorns in this country were largely produced from English stock that was taken into Scotland and bred for specific improvement in beef qualities. Some of the original Shorthorn animals that remained in England were bred for a dual-purpose type. The purpose was to breed animals that could produce a good flow of milk and could still produce an acceptable carcass. This breeding gave rise to the the Milking Shorthorn breed. The Shorthorn crosses well with other breeds of cattle, and it is probably more widely distributed than any other breed of beef cattle. Its popularity has carried it to all continents of the world.

The horn of the Shorthorn is a characteristic from which the breed was named; the horns should be rather short, refined, and incurving.

Color - Shorthorns vary in color. Some are red, some are white, and some combine the red and white colors in various patterns. The combination of colors may be roans, in which the red and white hairs mingle. They may be red and white spotted, with very little white. Some cattle which are recorded in the herd book as red have, in fact, some white along the underline or limited white markings. However, the most popular colors are the rich dark roan or rich dark red. Even though color is not an important consideration, breeders consider white legs in red and roan Shorthorns as objectionable.

Size - Shorthorns are one of the largest breeds of beef cattle. Mature bulls weigh 2,000 to 2,200 pounds; cows weigh 1,500 to 1,700 pounds when fitted for show. Animals in good breeding condition will weigh proportionately less.

Many cattle producers concede that Shorthorn cows have the best milking capacity of any of the beef breeds. This trait may account for the use of Shorthorn bulls in cross-breeding, to increase the milk flow of cows, and weight of the calves. Some producers claim Shorthorns are not as good grazers and rustlers as some of the other beef breeds.

Polled Shorthorn

The Polled Shorthorn was developed in Ohio, Indiana, Illinois and Minnesota in the late 1880's. In 1919, the Polled Shorthorn Association was organized, but in 1923 Polled Shorthorns became eligible for registry in the American Shorthorn Association. That same year the Polled Shorthorn Association disbanded.

Polled Shorthorns are identical in type with Shorthorn cattle. They have the same colors, form, quality, fleshing and all other characteristics except horns.

Brahman

History - The first Brahman foundation stock was imported into South Carolina in 1849 from India. Later importations were made into Georgia, Louisiana, and Texas. Southern Texas became the chief center of Brahman cattle in the United States.

Since this breed has been introduced into this country, the American breeders have, through selection, developed a breed with a much more beefy conformation. In 1924, this breed was confined to the

coastal region, but since then it has spread to nearly every part of the United States.

Conformation - Brahman cattle have a distinct hump over the shoulders, and an excess of loose skin under the throat, on the dewlap, and in the region of the navel and sheath. Desirable specimens of the breed have extremely deep but narrow bodies and are very muscular, not only in the hindquarters but throughout the body. The rump usually droops slightly, but nevertheless should be full and round. The ears are long and drooping. The head is longer than that of other beef breeds, and the horns usually turn up instead of down and out, as in the horned European breeds. Brahman cattle have well-developed sweat pores and, in contrast to European cattle, perspire freely. They are noted for their grazing and rustling ability under adverse conditions.

Brahman cattle have tough hides, short hair, and produce an oily secretion of the skin which causes an odor or taste offensive to insects and pests. Therefore, ticks and flies give them very little trouble. These cattle are hardy, good grazers, regular breeders, and endure a hot climate remarkably well. The calves grow off fast and usually show a high dressing percentage. Brahman cattle are wild under range conditions and they are often vicious and difficult to handle, but when confined and handled they become gentle.

In recent years Brahman bulls have been widely bred to native cows and cows of the European beef breeds, particularly in south Mississippi and the coastal areas of the South. Their offspring have the Brahman's milking ability, rapid development of calves, heat tolerance, insect and pest resistance, grazing ability, and carcass quality. Cancer eye is almost unknown in the breed.

Criticisms often directed at the breed include lack of body width, uneven lines, drooping rump, excess length of leg; excessive hide in the dewlap and sheath, and a tendency toward wild dispositions. Modern breeders are making much progress in correcting these characteristics.

Color - The preferred color pattern is that of silver-gray and usually there is a tendency toward darker color on both the fore and hindquarters. Some breeders have selected for a sandy or reddish color. Solid or gradual blending of two colors is acceptable. The muzzle and hoofs should be dark. Unpigmented

skin, a white nose, light colored hoofs, and a white switch are undesirable. Brindle color is a disqualification.

Size - The "Standard of Excellence for American Brahman Cattle" gives the size of a mature bull in good flesh at 1,600 to 2,200 pounds and a mature cow in good flesh at 1,000 to 1,500 pounds.

Question No. 30

Shorthorn cattle have been bred purposely to produce an animal that has the best _____ of any of the beef breeds and still produces an acceptable _____

Question No. 31

Shorthorn cattle are probably more widely distributed than any other breed of beef cattle and are popular for _____ purposes.

Question No. 32

List two criticisms of the Shorthorn breed:

a. _____

b. _____

Santa Gertrudis

History - This breed was developed from a cross between beef type Shorthorn cows and Brahman bulls on the King Ranch, Kingsville, Texas. Cross-breeding between these breeds of different species started in 1910 and continued about 15 years. The breed first started with the bull named Monkey. His sons and grandsons were used in the herds as rapidly as possible until eventually only bulls which descended from him were used. After 30 years of following a well-defined plan of selection, inbreeding, and linebreeding of the offspring of Monkey, the characteristics had become sufficiently well fixed for the Department of Agriculture to recognize the Santa Gertrudis as an established breed in 1940. It was the first distinctly American breed of beef cattle to be recognized. The breed association, Santa Gertrudis Breeders' International, was organized in 1951. The Santa Gertrudis breed carries about five-eighths Shorthorn blood and three-eighths Brahman blood.

Conformation - Santa Gertrudis is a horned breed of cattle, although polled individuals are sometimes seen. The ears are somewhat large and semi-pendulant. Both males and females are loose-hided, showing considerable dewlap and underline skin folds. Short, straight hair is characteristic of the breed. The breed was developed purposely for adaptation to sub-tropical climates and semi-arid ranching conditions.

The Santa Gertrudis makes large gains on grass and rustles for a living in areas of scant forage. The animals are noted for their rapid development and rate of gain. The breed shows very little evidence of the hump of the parent Brahman. It is considered to be better in beef type and disposition than the Brahman breed.

Color - The recognized color of the Santa Gertrudis breed of cattle is deep cherry red.

Size - The Santa Gertrudis is a large beef animal. Mature cows in well-fitted condition often weigh 1,600 pounds; mature bulls weigh about 2,000 pounds.

Question No. 33 Brahman cattle were first imported into the United States from _____

Question No. 34 The principal area of development of the Brahman breed has been in _____

Question No. 35 What three characteristics give the Brahman cattle a high degree of immunity to insects and pests, ticks, and flies?

a. _____
b. _____
c. _____

Question No. 36 What are four desirable characteristics of the Brahman breed that makes them particularly adapted to the South?

a. _____
b. _____
c. _____
d. _____

Question No. 37 What are six breed characteristics that make the Brahman so useful and a favorite for cross-breeding with other breeds?

a. _____
b. _____
c. _____
d. _____
e. _____
f. _____

Question No. 38 What are six criticisms of the Brahman breed?

a. _____
b. _____
c. _____
d. _____
e. _____
f. _____

Brangus

History - Brangus is a registered trade name and can be used only as applied to cattle registered with the American Brangus Breeders Association. The Brangus breed was started on Clear Creek Ranch at Welch, Okla., by crossing Brahman bulls with Aberdeen Angus cows. The Brangus breed is three-eighths Brahman and five-eighths Angus. The breed was developed because of the desire for a type of cattle that would produce good beef under difficult conditions. Not only are Brangus good grazers, but they also resist most diseases and insect pests.

Even though the American Brangus Breeders Association was not organized until July 29, 1949, at Vinita, Okla., the breed is considered one of the early truly American breeds of beef cattle.

Size - The Brangus is larger than either of the parent breeds. Mature cows in good flesh weigh about 1,500 pounds; mature bulls weigh about 2,000 pounds. The brangus produces good quality beef with a high dressing percentage.

Red Angus

History - The Red Angus had its beginning in the British Isles. Individual red cattle have been occurring in the Angus breed ever since its earliest development because certain strains of red cattle were used in its formation. On March 27, 1954, a group of breeders organized the Red Angus Breed Association. The red cattle produced in registered black Angus herds were the foundation stock for this new breed. No crossbreeding was ever used. Inherently, the Red Angus are the same size and have the same characteristics as the black Angus with the exception of their color.

Red Poll

History - This breed is native to the counties of Norfolk and Suffolk in England. These counties border the North Sea and comprise the most eastern part of England. The country is rolling, with some marshlands, and furnishes good grazing conditions. The climate is moderate and moist. The breed originated about 1815 by crossing horned Norfolk cattle with polled Suffolk cattle. John Reeves and and Richard England are credited as the originators. Red Poll cattle were first imported to the United States by G.F. Taber of Patterson, N.Y. in 1973. The breed was established in 1902.

Conformation - The breed possesses a polled head and fits the dual-purpose type in its best form. The animals are noted for early maturity, easy fleshing qualities, and a fairly good milk flow. The barrel is

developed to a greater extent than the major beef breeds, and the loin and hindquarters are more lightly fleshed. The bulls are very prepotent and give uniformity in offspring when bred to native cows.

Color - The breed is solid red, with white permissible in the switch of the tail and below the underline in limited amounts.

Size - At maturity, in medium flesh, the bulls weigh 1,800 to 2,000 pounds; cows weigh 1,200 to 1,500 pounds.

Question No. 39 Where was the Santa Gertrudis breed developed?_____

Question No. 40 From what breeds was the Santa Gertrudis breed developed?

a. _____

b. _____

Question No. 41 What is the fractional part of each of these blood lines in the Santa Gertrudis?

a. _____

b. _____

Question No. 42 For what specific situations was the Santa Gertrudis breed developed?

a. _____

b. _____

Question No. 43 What are four desirable characteristics of the Santa Gertrudis breed.?

a. _____

b. _____

c. _____

d. _____

Charolais

History - The Charolais had its beginning about 210 years ago in the old French province of Charolles. Charolles is in the hill country of east central France. The French found in the Charolais a good animal for work and meat. The animals were originally considered dual-purpose cattle. The thrifty French farmer wanted one animal to do many things. It had to be strong, vigorous, intelligent, and docile enough to work his fields.

The Charolais also had to grow to a large size, fatten economically to provide quality beef, and supply milk for the family farm. The present breeding program

calls for eliminating the work traits of these animals and concentration on the meat characteristics. The breed was introduced into Mexico in 1910 by Jean Pugibet and spread into the United States and Canada from his herds. The first Charolais were brought into the United States by King Ranch in Texas from Mexico.

Conformation - Most Charolais are naturally horned, but some are naturally polled. Most purebred calves are dehorned. The typical animal is very muscular, has bulging hindquarters and heavier bone and more length of body and leg than the English breeds. The breed presents a distinctive conformation because of heavy muscling in the loin and round. The cows are good mothers and produce sufficient milk to promote rapid growth of their calves. The breed apparently endures cold as well as heat and adapts to almost any climate.

Color - The Charolais varies from white to cream or light wheat. The skin and mucous membranes are reddish-pink, especially the nose, around the eyes, and the under-belly.

Size - The breed is one of the heaviest beef types in existence. Cows weigh from 1,250 to 1,700 pounds, though some have gone to 2,000 pounds. Mature bulls run from 2,000 to 2,600 pounds, and some have reached 3,000 pounds. The calves average between 85 and 95 pounds at birth. Fat calves may weigh 1,200 to 1,300 pounds at 14 to 15 months of age.

Question No. 44 — From what two breeds was the Brangus breed developed and what are the proportions of each?

a. _____ proportion _____

b. _____ proportion _____

Question No. 45 — What are four desirable characteristics of the Brangus breed?

a. _____

b. _____

c. _____

d. _____

_____

Barzona

History - The Barzona breed was developed on the Bard Kirkland Ranch near Kirkland, Ariz. The breed began in 1942 with the crossing of the Africander, Hereford, Santa Gertrudis, and Angus breeds. The traits desired were hard feet, sound legs, good milking ability, high browse utilization, wild type grazing, small calf at

birth, heat tolerance, close sheath, good depth of body, heavy hindquarters, rangability, width of pelvis, and marbling factor. The range type in the Bard Ranch area varies from a largely shrub semi-desert at about 1,500 feet elevation, through foothill country to rugged mountain country at about 5,300 feet elevation. The range runs about 70 percent browse and 30 percent grasses and weeds.

Conformation - The horn of the Africander has been dominant to the polled trait. Selection has been for regularity of production, a heavy weaning weight at 6 to 7 months, ability to make good gains, rangability in rough country, adaptability to varying range and pasture or feedlot conditions, superior feed utilization, and ability to grade Good to Choice when finished. Barzona cattle are noted for their hard feet and good bone. Their temperament is good, and they are easy to handle. The breed is a modern meat-type animal with a minimum of fat and with a large rib eye. They finish out at weights desired by the feeder and the packer, and they yield a good dressing percentage.

Color - The cattle are generally red, a bit lighter than the Santa Gertrudis. The red color of the Africander proved to be dominant to the black color of the Angus.

Size - The Barzona is of medium size. General weights of mature bulls from the range are 1,500 to 1,600 pounds. The cows from the range run about 1,000 pounds--heavier. A 14-year average weaning weight for all bulls was 480 pounds. A 16-year average weaning weight for all heifers was 432 pounds.

Beefmaster

History - The Beefmaster had its beginning on the ranch of Edward C. Lasater of Falfurrias, Texas in 1908. Brahman, Hereford and Shorthorn were crossed to arrive at the blend of breeding to produce the breed now known as the Beefmaster. The breed is based upon six characteristics which an animal must have to produce beef efficiently under practical commercial conditions: disposition, fertility, weight, conformation, hardiness, and milk production. The Lasater Ranch was one of the first in the United States to use systematic performance testing.

Conformation - Beefmasters are especially noted for their good backs, hindquarters, and strong straight legs. Their reproductive efficiency is quite high. Beefmasters are very heavy milkers and even under dry conditions wean husky calves. They can withstand a

wide variety of climatic conditions and are good rustlers. They will travel long distances to water when necessary. They learn to eat quickly in the feedlot and a change in ration does not disturb them.

Color - The color is quite variable because no selection has been made for this factor. Beefmasters can be dun, brown, reddish brown, red, and red with white extensions and spots. Red seems to be dominant as more calves are appearing in this color each year.

Size - These cattle have been bred for size and weight and they are big. Bulls in good grass condition will weigh an average of 1,600 pounds as two year olds and 2,200 pounds as five year olds. Calves often weigh 600 pounds or better at weaning.

Question No. 46

Which of the following breeds make up the Barzona breed: a.____, b.____, c.____, d.____, e.____?

(1)	Angus	(6)	Africander
(2)	Shorthorn	(7)	Beefmaster
(3)	Red Polled	(8)	Santa Gertrudis
(4)	Hereford	(9)	Brahman
(5)	Devon	(10)	White Face

Question No. 47

List six traits desired by the developers of the Barzona breed.

a. _____ d. _____
b. _____ e. _____
c. _____ f. _____

Charbray

History - The Charbray breed is a cross between the Charolais and the Brahman. Its development began almost at the start of the Charolais entry into the United States. Charolais bulls were imported, but no cows were available so the bulls were bred to Brahman cows.

Conformation - The Charbray is horned, and the hump of the Brahman is almost nonexistent. The cattle also show slight evidence of the Brahman dewlap and some extra hide in that area. The undesirable features most often observed are long and shallow bodies, too much length of leg, and coarse bone. The females are good mothers and their calves grow very rapidly. The calves may weigh an additional 100 pounds or more at weaning than calves of the standard breeds.

Color - Calves are usually born a light tan which usually bleaches out to a cream white. They are quite prepotent for this color when crossed with other cattle.

Size - Charbray are large cattle. Mature cows may weigh 1,700 to 2,200 pounds. The bulls may weigh 2,500 to 3,200 pounds.

Question No. 48

List 10 of the most important beef cattle breeds in the United States.

a. _____ f. _____
b. _____ g. _____
c. _____ h. _____
d. _____ i. _____
e. _____ j. _____

Question No. 49

List 4 factors to consider in selecting a specific breed of beef cattle for an individual herd.

a. _____
b. _____
c. _____
d. _____

Scotch Highland

History - This breed is native to the Highlands and west coastal islands of Scotland. The cattle were developed from the Kyloe and the Mainland Highlander. They were first imported to the United States in the middle 1800's.

Conformation - They are straight above and below, deep in flanks and thighs, long in hind and fore quarters, short in legs, and broad in hock. Ears are often short and split (they sometimes look as if they had been cut with ragged shears). They have a very shaggy coat of long hair.

Color - The colors are many and variable: blacks, brindle, reds, yellows, tan and silver.

Size - The Scotch Highlander is comparable in weight to other English beef breeds: 1,200 to 1,800 pounds.

The breed is particularly hardy in weather extremes, has exceptional mothering ability, disease resistance and is long-lived.

Prominence of Breed in the Area

This factor is not as important as it once was, because of modern transportation. However, it must be considered because cattle breeders continually seek animals they can bring into their herds for breeding. Other breeders are the major source of supply. Also, the breeder of purebreds depends upon the other breeders and grade breeders for the sale of bulls and surplus females. The number of breeders, particularly owners of grade-herds, in the area contributes much to the other breeders' sales. Breeders, of course, buy

buy from one another, but the grade-herd owners are the largest buyers. If more breeders are in the area than the demand will justify they may be unable to sell all of the surplus stock locally. An Angus breeder in the center of a Hereford area may be unable to sell animals locally, and would therefore find it necessary to ship them to distant markets

Grade-herd producers, find that cattle feeders are usually the best market outlet. Cattle feeders, particularly in some areas, are partial to some breeds, even though they are normally less concerned than breeders about the breeds. Producers of commercial cattle having good local markets will be wise to consider the breed most popular among feeders in the area, or the feeder market demand.

Personal Preference

Most cattle producers develop a liking for certain breeds of beef cattle. Color, form and general appearance have a personal appeal. Dollar value alone should not necessarily determine the breed one selects. Personal satisfaction and pleasure derived from the work is part of a satisfactory vocation. However, personal satisfaction and pleasure are greatly enhanced by higher dollar values. Farmers usually more zealously devote their time and capital to what they like. Therefore, personal preference should be given due consideration in selecting the breed of beef cattle.

Blood Lines

The term blood lines as used here is synonymous with families or family lines of breeding. In the development of the various breeds of beef cattle, individual breeders often use unrelated animals in their breeding program; thus separate families or blood lines soon take on significance in the improvement of certain characteristics of the breeds. Individual breeders of purebred animals have highly advertised their breeding stock based on the blood lines of their herds. There are many blood lines or families in each beef breed. Many cattle producers seek out certain cow families or blood lines for breeding stock, but most producers are mainly concerned with the families or blood lines of their bulls because the influence of the bull will be distributed to all the offspring of cows to which he is bred.

Individual producers breed certain families or blood lines to improve selected characteristics. Yet, in trying to improve these characteristics, other weaknesses or faults often develop in blood lines. For instance, several years ago dwarfism developed in one

of the most popular blood lines of one of the major beef breeds. This trait decreased the popularity of that line of breeding considerably. Similar incidents have occurred in various blood lines of practically all the major beef breeds.

Hence, farmers should carefully consider the line of breeding to be selected, once they choose a breed. Within the breed, many blood lines probably can be crossed successfully by experienced breeders. However, an individual just starting in the breeding business would probably be wise to select a blood line before the purchase of the first animal, then try to stay within that blood line for a few years to develop more experience in breeding cattle, and until the foundation of the herd has been accumulated.

Greater uniformity in the calves can be attained, and better results received from a herd bull if the females are bred alike. Some authorities claim that the bull is more likely to get a high percentage of good calves if the bull and females are of similar breeding. Yet some people object to this, claiming that some herd bulls of similar breeding would not cross well with the females. However, other authorities claim that the bull probably would cross well with any of them. It would be necessary to use another bull in the herd if he did not cross well.

After the farmer has decided on the blood line, the next step is to select a breeder who will be a good source of breeding animals. The farmer should visit as many purebred breeders in the area as possible. Most breeders will welcome a visit.

Arrangements with the breeder should be made well in advance of the visit to the farm.

In looking through a herd of cattle, pay particular attention to important matters such as size, type, soundness of feet and legs, body conformation, color markings, milking capacity, etc. Take a good look at the young calves; you can get a pretty good idea how well a cow herd is producing by paying particular attention to them. If most of the calves are short legged with wide, deep bodies, straight top and bottom lines, good heads and straight legs, then you know this breeder's cows are mating well with the herd bull. There should not be a high percent of off-type, poorly marked, undesirable calves in the herd from which the foundation animals may be selected. Remember, the successful breeder produces several outstanding calves in a herd each year. The

measure of a good bull is not that he produces a top calf or two each year, but how often and how many top calves he produces.

Select a breeder who is honest and fair in all dealings. Registration papers for an animal are only as good as the breeder makes them. Breeders who advertise their cattle and successfully sell their own cattle may help you find a buyer when surplus cattle are for sale. While visiting the breeder, determine the price of animals of the age and quality desired. Remember, the cheapest animal is not necessarily a good choice. Be skeptical if the animal lacks quality, type, or some of the good points essential in starting a herd. Neither is it always the highest priced animal that is the best buy. Sometimes breeders purposely price particular animals high because they want to keep those animals in their herds. Those breeders may quote high prices if they wish to maintain a certain blood line or develop selected characteristics in their cattle. Such animals may not necessarily be the best animal for the herd for the farmer's purposes.

Adult farmers, young farmers, and Future Farmer members may need help from a trained person such as a vocational agriculture teacher in selecting animals until they become skilled in this art.

Cow and Heifer Selection

When a breed, the blood line, and the breeder from whom the animal or animals are to be purchased have been chosen, individual animals must be selected. Good and inferior female animals exist in all breeds. Regardless of the breed, some general characteristics contribute to beef production. You should understand and use them as a basis of selection. The breeder of purebreds will be concerned with breed characteristics that affect an animal's eligibility for registration. Some features disqualify animals from the purebred records. For instance, an Angus having white anywhere except on the underline near the navel would be ineligible for registration as a purebred Angus. The prospective breeder should become familiar with numerous disqualifications. Breed associations will be glad to furnish this information. The breeder of non-purebreds may not be as choosy in this matter as the purebred breeder, but, like the purebred breeder, should carefully consider the factors that contribute to economical beef production--that part of body conformation that denotes good gaining ability and beef qualities.

The fact that an animal is purebred and registered by no means assures that the animal is of good type, possesses the best combination of desirable characteristics, or that it will perform well in another's herd. Yet, a close examination of the pedigree is valuable in selecting breeding animals.

The ability to judge or select beef cattle is one of the most essential and constantly used talents of the cattle producers. The practical producer must be a good feeder, a devoted caretaker, a skillful breeder, and must know how to buy and sell to good advantage. However, the ability to judge or select good stock is the basis of success in all of these phases of beef production.

The producers may use two methods to select breeding animals. The old time method selects by type, or body conformation. Current methods employ the same basis, plus performance (production) records, or "doing ability", as determined by the daily gain, etc., of the individual animal and its progeny.

Producers who buy or grow stocker and feeder cattle or fattening cattle for market will select for type, and should consider performance records as well.

Selection Based on Type or Body Conformation

When considering an animal for possible addition to the herd, take a good over-all look at the animal. Stand 20 to 25 feet from the animal. Observe whether the animal is of proper size for its age and breed (check the breed association score card for this information). Rapidly growing animals are important to economical production. Foundation animals should be at least average in size for their age and breed.

A beef animal's type should be reasonably low-set, blocky and compact. When the neck is removed at the shoulders, the tail removed, and the legs cut off even with the underline, the body should be rectangular. The shoulders should blend smoothly into the body, and there should be a full heart-girth. The neck should be short and thick. Check to see if there is a long-level rump with the tailhead blending smoothly into the rump. Is the top and underline straight? Does the animal have a good, uniformly deep body with a well-sprung rib? Are the legs straight, out on the corners, of the medium-size bones that are clean-cut and dense? Watch the animal's movement: It should be free and with style.

Now stand at the rear of the animal. The hindquarters should be deep and full, meated well down to the hocks

and the thighs thick and broad with a full and deep twist. Observe the top of the animal to see if it is broad, level and smooth over the back, loin and rump.

Then stand in front of the animal. Note the head. Is it feminine, broad, short, clean cut and slightly dished? Are the eyes full and expressive with good width between them? Is the distance from eyes to muzzle of moderate length? Is the muzzle wide and flaring with open nostrils? Are the shoulders smooth, compact, and broad on top? Is there a wide, moderately deep brisket that is free of flabby flesh and wrinkled skin and is not too prominent? The forelegs should be short, straight and squarely placed. Are they, also, wide apart, allowing for good width of the chest floor? Is there refinement in general in the animal?

Now move closer to the animal. Keeping the hands flat, feel down over the back, the loin and ribs to determine the amount and uniformity of fleshing over the region of valuable cuts. Breeding cattle do not need exceptionally good condition unless they are to compete for premiums in a show ring. Nevertheless, the covering should be uniform and free from patches and lumps. Animals carrying good fleshing usually are easy keepers and are desirable breeding stock prospects. Judge for these qualities only when comparing a prospect to other animals that are being given the same feed and management. Feel the hide. Is it of medium thickness, and pliable; the hair fine and soft?

Remember, there is no such thing as a perfect animal. The best judges in the country admit this. Weigh the previous points carefully. Emphasize the most important items. An undersized animal, when properly fed and managed, grows and matures slowly, and would be a poor choice. An animal that has shallow hind quarters, but a smooth tailhead, would be less desirable than one that is deep in the quarters and a little rough over the tailhead, if they are equal otherwise. Type, development in the regions of the most valuable cuts, size for age, health and vigor should receive the most emphasis when one buys breeding stock for commercial herds. As mentioned earlier, breeders of purebreds should give special considerations to characteristics that may disqualify an animal for registration.

If you select animals for foundation stock or herd replacements based on type, you are adhering to the old adage, "like begets like." However, this rule does

not always hold true because environment as well as heredity influences the appearance of animals. Cows and heifers maintained in a favorable environment will show certain desirable traits or characteristics to advantage over similar animals that had been maintained in an unfavorable environment.

Some of the breed associations have adopted a score-card system of type classification for use in breeding herds. Such type classification scores have been used to evaluate subjectively the breeding worth of cows and bulls. The value of this system would depend first upon the judgement of the person doing the scoring.

The Arkansas Agricultural Experiment Station conducted a study of selection for type in a small herd of Angus cattle from 1941 to 1957. During this study, scores were recorded on 9 herd sires, 40 original cows, and 177 heifers born in the herd. The researchers found that permanent differences between animals up to 10 years of age accounted for about half of the variation in scores for the same animals when scored twice a year by a committee. Young cows nursing their first calves scored considerably lower than the same animals did as heifer calves, bred yearlings, or later as mature cows. The study shows that the opportunity for overall herd improvement by selecting cows and heifers based on type-score alone is very small, yet it does have value. Several factors contributed to this conclusion: the long generation interval, the overlapping of generations, the chance of distribution of the sexes in small herds, the judgement of persons doing the scoring, and others. This study shows that in most small herds, where 15 to 20 percent of the cow herd is replaced each year, the opportunity for selection for type among the females is small.

Under conditions observed in this study, which are similar to those in many small one and two sire breeding herds, the opportunity for improvement through the sire may be about three to five times as great as the opportunity for improvement through saving heifer replacements.

There is little correlation between type and performance.

Question No. 50 What is the most essential and constantly used talent of the beef cattleman?_____

Question No. 51 What are the two methods that a beef cattle producer

can use to select breeding animals?

a. _____

b. _____

_____

Selection Based on Production Records

As previously mentioned the only characteristics that may be noted by visual inspection are size, body type, quality, bone and set of legs, breed and sex character and temperament. These traits are heritable to various extents and are also influenced by environment. Therefore, be sure to consider them when you select cows and replacement heifers for the cow herd.

Other desirable characteristics or productive traits have far more dollar value to commercial beef cattle producers than does type. These traits include: (1) reproductive capacity, (2) longevity, (3) birth weight, (4) weaning weight, (5) rate of gain, (6) efficiency of feed use, and (7) carcass qualities. These traits cannot be measured or determined by visual inspection or selection, based on type or conformation. They can be evaluated only by production or performance testing.

The USDA initiated performance testing programs in 1946 in cooperation with state agricultural experiment stations throughout the country. Programs were set up to account for variations in climatic conditions, feed supplies, and types of beef production.

Testing prospective breeding, cows and bulls, for their ability to match economically important traits is generally referred to as performance testing.

These tests measure an animal's ability to grow, convert feed to gain in weight, produce and wean a calf, or yield a high quality carcass. Performance tests are of the most value when any animal is compared with another, of the same age and fed similar rations under the same conditions.

Progeny tests measure the breeding values of cows and bulls based on the performance and appearance of the calves (progeny). The test data help to evaluate potential sires because the records of the offspring increase the reliability of pedigree information. Progeny tests are also most useful for evaluating traits that cannot be measured early in life: traits that are limited to one sex, such as milk production; traits that require sacrifice of animals, as in determining carcass qualities.

Review performance and progeny tests, with the perspective that the different characteristics or traits are heritable in varying degrees. Variations also will occur between herds and even individual animals in a herd. The best estimates of researchers work on the heritabilities of various characteristics are shown in table 13.

Table 13. Heritabilities of economically important characteristics in beef cattle

Characteristic	Percent heritable
Birth weight	50 to 70
Weaning weight	20 to 33
Yearling gain on range	30
Feedlot gain	60 to 65
Feed conversion	20 to 25
Slaughter grade	40 to 45
Dressing percentage	73
Carcass grade	15 to 30
Area of loin eye	65 to 70
Cancer eye susceptibility	25
Milk production	25

Reproductive Capacity

Beef cows must be regular breeders and produce a calf every year to be profitable. Experimental data indicates that that this trait is very low in heritability, but experienced cattlemen have noticed that certain cows fail to calve or calve later and later each year, while other cows consistently calve at regular intervals. Complete breeding records of cows and bulls are very helpful in selecting foundation stock and herd replacements as well as in culling cow herds.

Longevity

Profitable cows produce and wean a good-weight calf each year over a long, productive life. When this is not the case, replacement costs and feed costs run excessively high and profits vanish.

Birth Weight

The birth weight of calves is highly heritable. Successive calves from a cow tend to have similar birth weights. The age of a cow, sex of calf, and breed of calf also influence birth weight. Birth weights usually increase with the age of cow up to about 5 or 6 years of age. See table 14. Bull calves usually average about 5 pounds heavier at birth than heifer calves. The age of a bull does not affect the birth weight of a calf.

Table 14. Effect of age of dam on birth weights

Age of dam (years)	Number of calves	Average sex-adjusted birth weight (pounds)
2	20	68.1
3	95	72.6
4	80	76.1
5	75	78.4
6	57	78.5
7	55	78.1
8	44	79.8
9	38	78.2
10	25	83.0

Weaning Weight or Mothering Ability

The weaning weight and "bloom" of a calf indicate the mothering ability of a brood cow. The heritability of milking ability and weaning weight are reasonably high and about equal as shown in table 13. The weaning weight of a cow's first calf might serve as a reliable guide in selecting replacement stock for your cow herd because of the close correlation between the weaning weight of the first calf and successive calves.

Research conducted by the Virginia Agricultural Experiment Station and USDA indicates that the repeatability of cow performance is about 50 percent. However, weaning weight usually increases with the age of a cow up to about 8 years of age. Sex also influences weaning weight, with bull calves usually averaging about 30 to 40 pounds heavier than heifer calves.

Weaning weight and grade of a calf are also influenced by the sire.

Rate of Gain

The weight-gaining ability of calves after they are weaned, whether they are on pasture or in the feed lot, is a highly heritable trait--up to 50 percent or more. This trait is influenced equally by the calf's sire and dam. However, this trait is a major consideration in progeny testing of sires because one bull is bred to many cows. Complete performance and progeny test data on this trait are of value when you select replacement cows as well as bulls.

Sex also influences the rate of gain; bulls and steers usually gain up to 0.5 pound per day more than heifers on pasture or in the feed lot.

Efficiency of Feed Use

Fortunately this trait is very closely correlated with rate of gain. Nearly always, improvement in the rate of gain through selection of breeding stock is associated with a decrease in the amount of feed required per pound of gain. This highly heritable trait is influenced equally by the calf's sire and dam.

Carcass Qualities

Desirable carcass qualities include a high dressing percentage, a high proportion of lean to fat, marbling of the lean, and tenderness. The rib-eye or loin-eye area furnishes a good measure of the meatiness of a carcass. This trait is highly heritable and is of great economic importance because the highest priced cuts of beef come from the loin and rib. Of course, there is no direct way to obtain objective measurements of the carcass quality of prospective breeding animals. However, carcass data may be obtained from their near relatives--half brothers or sisters, or from their progeny. This trait is an important item in bull performance testing programs.

Science is providing space age tools to help identify and measure fat thickness, rib eye area and other lean tissues in live animals. High-frequency sound (ultrasonic) can measure fat thickness or the amount of lean tissues without harm to the animal. Electrogrammetry helps predict the percentage of wholesale cuts to expect without slaughtering the animal. Other instruments measure when to breed and determine pregnancy.

Question No. 52

From table 13, what are the four economically important characteristics in beef cattle that have the highest percentage of heritability?

a. _____
b. _____
c. _____
d. _____

Question No. 53

From table 14, what is the correlation between the age of cows and the birth weights? _____

_____

_____

_____

_____

Question No. 54

The weaning weight of a cow's first calf is a reliable guide in selecting replacement stock.

True_____ False_____

Question No. 55

What effect does the age of the bull have on the birth weight of the calf?

Dwarfism

In recent years the appearance of dwarfism, particularly in the Hereford and Aberdeen Angus breeds, has caused alarm as well as considerable financial loss among purebred breeders. Dwarfs seem to occur most frequently in certain blood lines and have hurt the popularity of these lines considerably.

These dwarfs are often called snorter or bulldog dwarfs. Dwarfism in a newborn calf is usually characterized by extremely short legs, exceedingly stocky body, bulging forehead with protruding eyes and dished face. Usually they are only one-half normal size, but the birth weight may be nearly normal. Labored breathing (snorting) is usually evident. Many die soon after birth and few live more than 1 year. Those that survive soon develop a paunchy stomach, heavy shoulders, and crooked hind legs.

Dwarfism is inherited as a simple recessive character that may be carried by the cow or the bull. However, when only one parent carries the dwarf gene no dwarf calves will occur, but the dwarf gene will be transmitted to one-half of the offspring from such matings. Dwarf calves occur only when both the cow and the bull carry the dwarf genes and then only about one out of every four calves will be dwarfs.

Research workers and breeders continue to devote much study to methods of identifying carrier animals. The use of progeny testing has been of great value, but allows rather slow progress. During the past few years, the use of X-ray photo techniques on the spines of calves at birth have shown promise of progress in identifying carrier animals.

When you select cows or bulls for a herd, carefully check whether dwarfism has occured in the herd or in the blood lines within the herd breeding program of the prospective source of any breeding stock.

Bull Selection

Every time a bull is mated to a cow he influences future herd replacements and the value of feeder or slaughter cattle, either good or bad, depending on his ability to transmit type and producing ability to his offspring. The use of a bull that transmits poor type or low producing ability can easily wreck a herd

in a short time. This risk underscores the importance of selecting a bull that has the ability to transmit good type and high production traits to his offspring.

The saying, "the bull is half the herd," is almost literally true. The sire and dam, of course, each contribute 50 percent to the genetic traits of their offspring. However, producers often mate 1 bull with 25 to 30 cows, or more, each year. Hence, we see why it is many more times important to select the very best bulls possible for use in the cow herd. A study at the Arkansas Experiment Station shows that three to five times greater herd improvement could be accomplished by selecting good bulls than by the selecting good brood cows.

Bulls should have the same general characteristics as a cow or heifer. In addition, the bull should show masculinity and breed character.

A bull may be selected on the basis of type or conformation in the same manner as cows and heifers. Or, bulls may be selected on the basis of performance and progeny tests.

FEEDER CATTLE SELECTION

Feeder cattle are unfinished cattle, not carrying enough condition to make the slaughter grade that they are capable of making, and which are generally sold to cattle feeders to put into a feed lot for fattening.

There is no specific answer as to what kind of cattle is best to feed. A number of factors must be considered in selecting feeder cattle, such as (1) classes and grades of feeder cattle, (2) the length of time they are to be fed, (3) the kind and amount of feed available, (4) the price of feed, (5) the price spread between feeder and slaughter cattle, and (6) the future market outlook. A number of other factors--breed, location, supply, experience of feeder, etc., are involved in selecting feeder cattle, but space will not permit discussing them.

Question No. 56 In what breeds is dwarfism most common? _____

Classes and Grades

Feeder Cattle are classified and graded according to age, sex, weight and conformation of type.

Age

Feeders are classified by age as calves, yearlings, and 2-year olds. All cattle are designated as calves until they are 1 year old. Yearlings are between 1 and 2 years of age. Yearlings under 18 months of age are often called short yearlings, and those over 18 months of age are often called long yearlings. Cattle between 2 and 3 years of age are designated as 2-year-olds. Very few cattle over 3 years old are fed out and those are usually cows, bulls, and stags.

Age is a very important factor in selecting feeder cattle. Age affects (1) the capital investment, (2) rate of gain, (3) use of different kinds of feeds, (4) length of feeding period, (5) amount of feed required, and (6) economy of gain.

Feeder calves usually require the least capital investment per head because of their age and lighter weight, even though the cost per pound may be from 2¢ to 4¢ more than 2-year-olds. This factor may be very important when the price of feeder cattle is high and investment capital is limited.

Generally, cattle grow and gain meatiness most rapidly during their first year, and grow and gain more slowly as they get older. However, when cattle are thin from insufficient feed, the rate of gain will be directly correlated with their age.

Calves and short yearlings are unable to use large amounts of roughages and pasture, particularly poor quality roughages. Young feeder cattle must have feed to meet their requirements for growth, development, and fattening at the same time, whereas older cattle do not have to meet this growth requirement. Younger feeder cattle require high quality feeds, while older cattle can gain from poorer quality and bulkier roughages. Therefore, the kind of feeds available, particularly roughage, might be a very important factor in selecting feeder cattle.

The length of the feeding period is influenced by the age of cattle. Young cattle gain faster and hence can usually be fed profitably over a longer period than can yearlings or 2-year-olds. An average of 5 to 6 months may be required to finish 2-year-old steers to High-Choice or Prime slaughter grades, while 7 to 8 months would be required with yearlings, and 8 to 9 months with calves.

Age has very little effect upon the total amount of feed required to bring feeder cattle to the same condition of finish if they are started on full feed

in the same condition. This is because younger cattle eat less feed daily.

Age directly affects the economy of gain. Young cattle gain more rapidly, and part of this gain is due to growth and development rather than just putting on fat as in the case of older animals. Nevertheless, it makes for economy of gain.

Sex

Cattle are classified as steers, heifers, cows, bulls, and stags, based on sex.

Steers gain faster and more economically than heifers, even though heifers reach the same degree of finish a little earlier in the feed lot. Feeder heifers usually sell at a lower price than steers. The same differential in price exists between slaughter steers and heifers. A much higher market demand exists for steer beef than for heifer beef. Very few cows, bulls, and stags are fed out for slaughter.

Weight

The classification based on weight is a relative measure and applies only to calves and to steer and heifer classes. The weight classes are designated as light, medium, and heavy, and are largely determined by the age of the cattle. The amount of condition also determines the weight classification. When you select feeder cattle for a planned feeding program, consider weight in relation to age and condition.

Market Grades

Official standards for market grades of feeder cattle are developed by the USDA. Grades of feeder cattle are based on breeding (type and conformation), quality, condition or finish, constitution and capacity. The market grades of steers and heifers are (1) Fancy, (2) Choice, (3) Good, (4) Medium, (5) Common and (6) Inferior. The highest grade for cows, bulls, and stags is Choice.

(1) Fancy feeders are usually purebred, of excellent beef type and body conformation, with exceptional smoothness and a high degree of finish. They command such a high price that they are rarely profitable except with the few most skilled and experienced feeders who can finish them as Prime slaughter cattle.

Very few feeders are graded Fancy, and these are usually calves raised by FFA and 4-H Club members to be exhibited in fat stock shows.

(2) Choice feeder cattle are of good beef type, and body conformation is of good quality. They carry

a rather high degree of finish. They are usually purebred or high grade animals with uniform breed characteristics. Commercial feeders who buy Choice feeder cattle expect to finish them as High-Choice or Prime slaughter cattle.

(3) Good feeder cattle show less quality, less condition, less compactness of body conformation, and are more leggy and not as smooth as the higher grades. Many cattle of this grade are raised by commercial feeders because the animals cost less than the higher grades and can usually be finished to grade at high-Good or low-Choice. Most cattle in this grade are not purebred.

(4) Medium feeder cattle usually show evidence of some dairy breeding. They are usually "leggy" with narrow, shallow bodies, and in rather thin condition. However, they may be profitable for short feeding periods with considerable roughage in their rations. Producers profit because they can buy these animals cheaply, and do not spend any more than needed for feed, etc., to finish them out any higher than Good grade slaughter animals.

(5) Common feeder cattle more nearly resemble dairy animals, and show very little beef type or body conformation. They have long, narrow, shallow bodies and are usually unthrifty and in thin condition. They are adapted only to short feeding periods with high roughage content rations.

(6) Inferior feeder cattle are nearly always of dairy breeding, lacking uniformity in color, size, and shape of body. They are usually unhealthy, stunted, and extremely thin. The risk is high in attempting to feed out common and inferior grades of feeder cattle.

Length of Feeding Period

The length of time that cattle are to be fed certainly influences the selection of feeders. Young, high quality animals can be profitably fed for the longest periods of time, and older, low-grade animals can be profitably fed for only short periods.

Kind and Amount of Feed Available

The feed supply largely determines the kind, age and quality of feeder cattle to select. High quality calves and short yearlings require high quality feeds, largely concentrates, and can be profitably fed for relatively long periods; hence, they would require a large supply of feed. Older cattle and cattle in the lower feeder grades can use relatively large amounts

of poor quality roughages, but usually can be profitably fed for shorter periods. The amount and kind of feed supply determines the number and kind of feeders that can be fed out. The amount of concentrates required varies very little between the ages of feeder cattle of the same grade when they are fed out to the same finish. On the average, 35 to 40 bushels of corn are required to finish out an animal at good slaughter grade. The amount of roughage required, however, is in direct correlation with the age and quality of the feeder cattle.

Table 15. Feed required per feeder animal

Age of cattle	Length of feeding period (days)	Roughage* per head (pounds)	Grain and concentrates per head (pounds)	Average expected gain per head (pounds)
Calves	180	1,000	2,000	400
Yearlings	150	1,500	2,000	400
2-year-olds	120	1,600	1,900	300

* 3 pounds of silage equal 1 pound of hay.

Price of Feed

This is an important factor in selecting feeder cattle. For instance, poor quality roughage is always cheap, yet only older cattle or low-grade feeders can use it to advantage. The price of grain and protein concentrates wouldn't influence the selection of feeder cattle very much because about the same amount of these feeds are required for practically all grades of feeders.

Of course, the prices of feed, feeder cattle, and slaughter cattle are important, too. When the price of feed is high, older cattle might be the best buy because of the shorter feeding period with lower quality feeds. Often, cattle feeders are lucky if they can break even on the cost per pound of gain, or finish, that they put on feeder cattle. When the price of feed is low, a profit may usually be expected from the gain put on feeder cattle. In most cases the cost per pound of gain is more than the selling price per pound of slaughter cattle.

Question No. 57 What are the market grades for feeder cattle?

a. _____ d. _____
b. _____ e. _____
c. _____ f. _____

Price Spread Between Feeder and Slaughter Cattle

The difference--or spread--between the cost per pound of feeder cattle and the selling price per pound of the same cattle when fattened for slaughter is important in selecting feeders. This price spread varies from year to year and usually between seasons in any given year. Experienced cattle producers try to put enough gain on feeders to finish the animals out at a higher slaughter grade than they graded as feeders. Thus, the producer receives an increased price per pound over the cost of the feeders. As stated earlier, the cost per pound of gain in many instances--if not most--is more than the selling price per pound obtained at market time. Hence, fed cattle must sell at a higher price per pound than was paid for them as feeders to make a profit.

The amount of spread or margin necessary for profit depends mainly on the initial cost of the feeders and the price of feed. The age, size and grade of feeder cattle selected also influences the margin required for profit. Older, heavy feeders require less margin for profit because of the greater weight at market time on the existing spread. The higher grades of feeder calves also usually require less margin for profit because of their rapid, efficient gains. On the other hand, light weight yearlings that must be fed a considerable length of time to finish them out require a greater spread in prices.

Experienced feedlot operators usually know how much feed is needed for different cattle. This knowledge enables them to calculate how much they can afford to pay for feeder cattle, or how much spread in price would be required to make a profit.

Future Market Outlook

Be sure to study the price prospects for fed slaughter cattle before you decide what kind--age, weight, and grade--of feeder cattle to buy. Cattle prices usually run in cycles. In addition, cattle prices usually vary between seasons every year. On the upward trend of cattle prices the buyer does not have to be as careful in selecting feeder cattle as on the downward trend. Study the price outlook for various grades of slaughter animals in the immediate future as well as the longtime trend. Look at different times of the year, market demands, and consumption patterns. For instance, if the market outlook is favorable for the immediate future but the long-time outlook is doubtful, the best buy would most likely be older, heavy-weight cattle that could finish in a 90- to 120-day feeding period. On the other hand, if the long-time market outlook is favorable, the best buy might be light weight calves and yearlings which could profitably be fed 180 to 240 days.

Many feed-lot operators now select their feeder cattle from herds where performance testing programs are conducted. They like to secure feeder cattle from high indexed sires with a record for a high rate of gain. With so many factors involved, the selection of feeder cattle requires careful study. Some feed lot operators place their orders with livestock commission firms whose buyers are expert judges of cattle, rather than risk their own judgement.

BREEDING BEEF CATTLE

The Value of a Good Bull in a Herd

The genetic make-up of an animal is determined equally by both parents--50 percent by the bull, and 50 percent by the cow. Because a bull can have 25 to 40 or more offspring in a year and many, many more during his lifetime than does a cow, he is much more important than a cow, from a hereditary standpoint. For this reason progeny testing of beef cattle is usually confined to bulls.

The old saying that the bull is half the herd does not imply that the value of the bull is equal to half the value of the cow herd. However, it illustrates the point that a good bull is of much more relative importance than a cow in a herd. A good prepotent bull can stamp his own characteristics--type, conformation, ability to gain, color, etc.--on his calves.

The value of a good bull in a herd depends partly on the type of production program. A very good purebred bull probably is of greatest value in a herd of common or low-grade cows because he improves the type and quality of calves the most in this kind of production program. Yet, a purebred breeder can't afford not to have the very best bull available to produce the kind of breeding stock required to sell to other purebred breeders or commercial cattlemen with grade herds.

A conservative estimate of the value of a good bull in a herd would be at least three to five times the value of a cow. Often the value of a good bull is much higher, depending largely on the type of beef cattle production program.

The Value of a Good Cow in a Herd

Although a cow contributes one-half of the characteristics in her calf, the dominance of certain characteristics may be linked or associated with sex and will be transmitted to the offspring in combination with sex. For instance, a cow with outstanding

mothering ability and milking qualities will most likely transmit these characteristics to her daughters, making them desirable for herd replacements. The birth weight and weaning weight of calves is determined to a large extent by the cow. Cows that raise light-weight calves--according to their age--should usually be culled after the first or second calf, because this characteristic would appear in many of her offspring and their progeny.

The value of a cow in a herd is much less than that of a bull because she contributes to the improvement of only one calf each year. Quality improvement in the herd would be slow because of the length of time between generations. This comparison is not meant to belittle the importance of selecting top quality, high producing cows.

The value of a cow in a herd is determined by her ability to raise and wean a good heavy calf every year.

Length of Time the Same Bull Used in a Herd

The length of time that any bull should stay in service of the same herd depends on several factors: system of breeding, age of bull, number of cows per bull, manner of mating, care and management, etc.

System of Breeding

Where inbreeding and linebreeding systems are followed, the same bull can be used in a herd much longer than when other systems of breeding are followed, because these two systems involve the mating of closely related animals. Outcrossing, crossbreeding and upgrading systems do not involve the mating of related animals. Hence, the length of time the same bull should remain in a herd would be limited to about 3 years, unless fencing and management keeps the original cow herd separate from the offspring of their matings.

Age of Bull

Bulls usually reach sexual maturity and produce viable sperm before they are 12 months old. However, they should never be bred when younger than about 15 months of age, to allow time to grow and develop and reach a higher degree of fertility.

Breed yearling bulls sparingly, and not more than 10 to 15 cows per year at weekly intervals during the breeding season. Do not have them in the pasture with the cow herd. Two-year-old bulls may serve 20 to 30 cows, and three-year-old bulls may serve 30 to 50 cows, depending upon the manner of mating. Bulls are usually mature at 3 or 4 years of age.

Bulls usually retain their vigor and fertility up to about 8 years of age, depending, of course, on the amount of service they have rendered. Therefore, the length of time the same bull should be kept in a herd will depend to a degree upon his age when put in service with a herd.

Number of Cows Per Bull Unit

The number of cows that a bull can successfully serve depends on the age of the bull and the manner of mating. The suggested number of cows that should constitute a bull unit was based on hand mating or controlled mating, where the bull is allowed to serve a cow only one time.

Manner of Mating

Two types of mating are commonly practiced, hand mating or controlled mating, and pasture mating. Hand mating consists of keeping the bull in an enclosure and bringing the cows to the bull for one service when they are in heat. This type of mating requires a lot of time and close attention to the cow herd--about twice each day--during the breeding season. Hand mating conserves the vigor and fertility of the bull and considerably extends his reproductive life. Yet, it requires so much labor and trouble that it is seldom used in commercial herds. Purebred breeders usually employ this manner of mating because registration requires specific breeding information that would not be obtainable any other way.

Pasture mating simply lets the bull run with the cow herd in the pasture. A bull often serves the same cow repeatedly during the heat period, which saps his vitality and fertility. A bull soon wears himself out this way and cannot satisfactorily serve as many cows during the breeding season as where hand mating is used. In the pasture system of mating, one mature bull can usually take care of about 25 to 35 cows. The bull should not be kept in the herd much longer than 2 years to prevent mating with his daughters, which is generally undesirable. Most cattle producers follow this system of mating because it is simple and involves little or no labor. They depend on the bull to settle all cows as they come in heat.

Question No. 58

The genetic makeup of any individual animal is determined approximately _____ by the bull and _____ by the cow.

Question No. 59

Why is a bull a much more important individual in a herd than a cow, from a hereditary standpoint?

_____

Question No. 60 The value of a good bull in a herd is conservatively estimated to be at least _____ the value of a cow.

Question No. 61 Cows that are selected for the breeding herd should be of good quality, high producing cows. However, the primary value of a cow in a herd is determined by her ability to _____ every year.

Question No. 62 Bulls reach sexual maturity before _____ months of age, but should not be used for breeding purposes under _____ months of age.

Question No. 63 Bulls usually mature at _____ or _____ years of age and retain their vigor and fertility up to about ____ years of age.

The Different Systems of Breeding

The various systems of breeding are: (1) purebreeding, (2) inbreeding, (3) linebreeding, (4) outcrossing, (5) crossbreeding, and (6) upgrading. No single system is best. Each system has advantages and disadvantages, depending on the situation of individual cattlemen. Determine the system of breeding you want by carefully considering the size and quality of the herd, operating capital, your skill and experience, and the purpose of the production program.

Purebreeding

This system involves the mating of animals of the same breed which are registered or eligible for registration by the breed association. Purebred breeding is a highly specialized business, and only the most experienced cattle producers should undertake it. However, this system of breeding is the basis of foundation stock and of replacement breeding animals for other purebred breeders and commercial cattle producers. Purebred breeders are essential for improvement in the beef cattle industry. This system of breeding requires high operating capital. Very few breeders achieve outstanding success.

Inbreeding

This system of breeding involves the mating of closely related animals such as sire to daughter, brother to sister, or son to mother. This system is often called closebreeding, and was widely used in foundation stock to establish nearly all of the beef breeds. Inbreeding intensifies the production of

animals uniform in type and other characteristics. This system is now limited to a few breeders who have purebred herds of such highly developed type and quality they feel that no further improvement could be made by getting breeding stock outside their own herds.

Although inbreeding intensifies desirable traits, it may also intensify undesirable characteristics. Therein lies the danger of inbreeding for all cattle producers with herds of no more than average quality. The use of this system requires very rigid culling to eliminate the fixing of undesirable traits, and hence is expensive.

Linebreeding

This system is almost the same system as inbreeding, just less intense. Linebreeding consists of mating animals not closely related, such as half brother to half sister, cousins, grandparents to their offspring, etc., all of which trace in pedigree to an outstanding ancestor. This system of breeding was widely used in developing family lines or blood lines that have been so popular for the past quarter century. In the Hereford breed for instance, Prince Domino was an outstanding sire developed by the Wyoming Hereford Ranch about 1915, and linebreeding was practiced for many years to perpetuate his good reproductive traits.

Linebreeding does not offer the possibilities for improvement as does inbreeding, nor does it offer the possibilities for regression or the intensifying of undesirable characteristics as inbreeding does. Linebreeding is better suited to improve the herds of larger purebred operations. It is never used in grade or commercial herds.

Outcrossing

This system of breeding consists of the mating of animals of the same breed, but which have no close relationship in the pedigree. For practical purposes they might be considered as unrelated animals. This system is probably the most widely used among the purebred breeders, except in the largest and most highly advertised herds. Outcrossing is sometimes called linecrossing, and is practical and safe because two unrelated breeding animals are unlikely to transmit the same undesirable traits to their offspring. In fact, many purebred breeders often remedy a weakness or undesirable trait that occurs in their herd by outcrossing with an animal known to be especially strong in such trait.

Question No. 64

In pasture mating, how long should you keep the same bull with the same herd?

Crossbreeding

This system consists of the mating of purebred animals of different breeds. This system of breeding has been used to develop American breeds of beef cattle such as Santa Gertrudis, Brangus, Charbray and Beefmaster. Most of these were bred for specific purposes such as resistance to heat and insects, hardiness, rate of gain, ruggedness, etc.

In broad terms, crossbreeding also includes the mating of purebred sires of one breed with high grade cows of a different breed. This practice is followed by most commercial cattlemen with grade herds. Crossbreeding gives the offspring the advantage of hybrid vigor, and often an increase in rate of growth and efficiency of production. When a good selection is made of animals for crossbreeding, particularly the bulls, the desirable traits in both parents seem to be strengthened, and the undesirable traits seem to become recessive or overshadowed. The limitation of this system, of course, lies in the cow herd replacement program, for in a very few generations the cow herd most likely would lack uniformity in size, color, and conformation if replacement heifers were saved from the herd.

Upgrading

This system of breeding mates purebred sires of any pure beef breed to native, nondescript grade cows and their progency. The purposes are to develop uniformity, improve quality, and increase performance in the offspring. The greatest progress is made in the first cross because 50 percent of the inheritance of the offspring comes from the bull. Progress will continue to be made by following this system through about the fourth generation cross, by which time the animals will be carrying about 94 percent pure blood or breeding of the sire and will look and perform nearly like purebreds.

This breeding system is followed by most commercial beef cattle producers in the South. The producers have made wonderful progress during the past decade or more in improving the quality of their cattle. The big problem is to get farmers to select really good purebred bulls for this system.

The Value of Crossbreeding

Crossbreeding generally results in hybrid vigor in the offspring. Other advantages of crossbreeding include:

(1) Heavier birth weight
(2) Increased growth rate
(3) Heavier weaning weight
(4) More rapid gains in the feed lot
(5) Increased fertility
(6) Larger and heavier animals at maturity
(7) Higher dressing percentage
(8) Fewer digestive disturbances when on feed
(9) Better body conformation
(10) Better carcass quality

The extent to which these potential advantages are achieved depends largely on the breeds crossed, the breed of each of the parents, the quality of the animals crossed, environmental conditions and other factors. The following tests at several experiment stations show some of the values of crossbreeding.

Louisiana - Iberia Livestock Experiment Station at Jeanerette:

From 1932 through 1946, purebred Brahman bulls and purebred Africander bulls were crossed with a herd of purebred Angus cows. Crossbreeding was carried through two and three generations. Fifteen-year results showed that all crossbred calves were heavier at birth and at weaning, and grew to maturity more rapidly than did the purebred Angus.

A feeding test was conducted with steers of first and second generation Brahman X Angus half-breds, first generation three-eighths-bred, and quarter-breds backcrossed, compared with purebred Angus, and Africander X Angus half-breds first generation. The results are shown in table 16.

Experiments at the Iberia Station since 1916 show superior performance from crossbreeding, but point out that care must be exercised in the selection of breeding stock. When grade cows were used as a foundation, best results were obtained by using a bull of one of the standard beef breeds, then crossing the first generation heifers with a Brahman bull and backcrossing the resulting female progeny with a bull of the same breed as the original beef-type bull.

Question No. 65 What are the six listed systems of breeding?

a. _____ d. _____
b. _____ e. _____
c. _____ f. _____

Table 16. Average beef-production data for purebred and crossbred steers fed to a final weight of about 750 pounds

Item		Purebred Aberdeen Angus	Brahman X Angus				Africander-Angus halfbreds, first generation
			Halfbreds		Three-eighths-breds, first, generation	Quarterbreds, backcross generation	
			First generation	Second generation			
Steers	number	11	15	5	7	22	15
Birth weight	pounds	64	71	65	59	62	70
Weaning weight	pounds	404	454	453	435	444	444
Gain from birth to weaning	pounds	340	383	388	376	382	374
Age when weaned	days	265.3	232.0	227.0	252.0	237.5	228.0
Daily gain to weaning	pounds	1.28	1.70	1.71	1.49	1.61	1.64
Final weight	pounds	754.0	754	754	748	752	753
Carcass weight (cold)	pounds	398	414	411	384	411	399
Gain on feed	pounds	350	299	300	313	308	309
Period on feed	days	294	235	233	261	257	246
Daily gain on feed	pounds	1.19	1.27	1.29	1.20	1.20	1.25
Efficiency		11.45	11.32	11.32	10.86	10.45	10.85
Carcass grade		16.7	19.0	18.8	17.1	17.8	19.1
Carcass yield	percent	52.74	54.91	54.51	51.37	54.64	53.02
Age at slaughter	days	559.6	467.5	459.2	513.0	494.1	474.0

Question No. 66 Which system is most important to National Forest permittees and is used most extensively by them?

a. _____
b. _____

Question No. 67 What are four main benefits to be derived from cross breeding?

a. _____
b. _____
c. _____
d. _____

Question No. 68 What is the most undesirable result of crossbreeding?

_____
_____
_____

Question No. 69 How is the upgrading system of breeding carried out? _

_____
_____
_____

Question No. 70 What is the purpose of the upgrading system of breeding?_____

_____
_____
_____

Question No. 71 When is the greatest progress made in this system and why?_____

_____
_____
_____

Question No. 72 If we assume purebred bulls are bred with native cows and then with the offspring heifers of each cross, what will be the percentage of purebred (desirable) traits in each of the first crosses?

a. First cross - first offspring - _____ percent.
b. Second cross - second offspring - _____ percent.
c. Third cross - third offspring - _____ percent.
d. Fourth cross - fourth offspring - _____ percent.

_____

Alabama - Black Belt Substation at Marion:

This Station started a test in 1948 to determine if Brahman-sired calves would sell as milk-fat animals to better advantage than calves sired by bulls of the breeds common in the area. Farmers wanted to know the value of breeding Brahman bulls to their grade cows. No thought was given to the value of Brahman breeding in cows.

The cow herd of well-bred grade Hereford cows was equally divided according to number and productive ability, and bred to Brahman, Hereford, and Shorthorn

bulls. The bulls were turned in with the cows at the same time, varying from December 1 to January 15, during the test period.

The most desirable calves for Black Belt conditions are dropped from September through January. Spring calves, considered second choice, are dropped from February through June. The bulls were separated from the cows so that no calves would be born in midsummer.

The cows were wintered on johnsongrass hay and cottonseed meal. In the spring and summer they grazed on white clover and dallisgrass. The calves were sold at public auction as milk and grass-fat animals with no supplemental feeding. The Brahman crossbred calves were considerably more tolerant of heat than were the other breeds. The results of this study are shown in tables 17, 18, and 19.

Question No. 73 A test conducted in Louisiana from 1932-1946, which compared purebred Angus cattle performance with Brahman and Angus crosses, demonstrates the effectiveness of crossbreeding. What was the daily gain to weaning of the purebred Aberdeen Angus _____ and the daily gain to weaning of the first generation halfbreed Brahman and Angus?_____

Question No. 74 What was the daily gain on feed in the Louisana test of Aberdeen-Angus_____ and the daily gain on feed of the first generation halfbreed Brahman and Angus?_____

The results of this experiment show some advantage to breeding either Brahman or Shorthorn bulls to well-bred Hereford cows grazing improved pastures under Black Belt conditions. The resulting calves showed additional gain over straight-bred calves and some advantage in market price.

Slaughter buyers did not discriminate against either type of crossbred calf, but some discrimination was shown by stocker and feeder buyers. None of the Brahman-Hereford calves were bought by stocker and feeder buyers, who showed some preference for the Herefords over the Shorthorn-Hereford crosses.

Texas - Texas Agricultural Experiment Station:

A study in 1956 shows that crossbred steers produce carcasses equal, if not superior, to purebred steers. Note the percentages of the high-priced cuts--loin,

Table 17. Comparison of Hereford calves with Brahman-Hereford crossbreed calves, fall- and winter-dropped, Black Belt Substation, 5-year average, 1948-49 to 1952-53.

Breed	Number calves	Birth weight	Market age[1/]	Daily gain[2/]	Market weight	Market price	Market value
	No.	lbs.	Days	lbs.	lbs.	Per cwt.	Per head
Hereford	122	67	271	1.77	524	$27.03	$141.64
Brahman-Hereford	100	77	262	1.83	534	27.23	145.41

1/ Brahman-sired calves remain in dam 10 to 12 days longer than other calves.
2/ Figured on home-weight basis.

Table 18. Comparison of Hereford calves with Brahman-Hereford and Shorthorn-Hereford crossbred calves, fall- and winter-dropped, Black Belt Substation, 3-year average, 1950-51 to 1952-53.

Breed	Number calves	Birth weight	Market age	Daily gain[1/]	Market weight	Market price	Market value
	No.	lbs.	Days	lbs.	lbs.	Per cwt.	Per head
Hereford	70	68	274	1.70	517	$26.67	$137.88
Brahman-Hereford	71	78	262	1.79	527	27.02	142.40
Shorthorn-Hereford	58	66	276	1.73	526	27.12	142.65

1/ Calculated on home-weight basis.

Table 19. Comparison of Hereford Calves with Brahman-Hereford crossbred calves, spring-dropped, Black Belt Substation, 3-year average; 1949, 1950, and 1952.

Breed	Number calves	Birth weight	Market age	Daily gain[1/]	Market weight	Market price	Market value
	No.	lbs.	Days	lbs.	lbs.	Per cwt.	Per head
Hereford	36	73	223	1.87	471	$25.45	$119.87
Brahman-Hereford	28	81	218	1.96	493	25.49	125.67

1/ Calculated on home-weight basis.

Table 20. Carcass characteristics of purebred and crossbred steers

Components	Purebred Hereford	Brahman X Hereford Crossbred
Number	18	20
Age (days)	435	427
Slaughter weight (pounds)	741	795
Chilled carcass weight (pounds)	466	501
Dressing percent	60.25	63.05
Chilled weight per day of age (lbs.)	1.03	1.17
Carcass grade	High Good	Med. Good
Length of body (inches)	43.59	44.77
Length of leg (inches)	27.08	29.46
Area of rib eye (square inches)	8.39	9.15
Forequarter percent	50.25	49.86
Hindquarter percent	49.75	50.14
Rib percent	9.14	8.99
Chuck percent	24.89	25.09
Short loin percent	7.47	7.32
Loin end percent	8.19	8.06
Round rump off, percent	20.31	20.90
Total rib, round, loin, percent	45.11	45.27
Estimated percentage composition of carcass:		
Bone	15.02	15.33
Fat	29.50	27.37
Lean	56.71	58.40

Source: Performance as a Guide to Beef Herd Selection, B-809, Agricultural Experiment Station, College Station, Texas; 1956.

rib, and round--the proportion of lean to fat, and dressing percentage as shown in table 20.

When Should Cows be bred?

This question involves several factors; (1) age of heifer for first breeding, (2) heat period, (3) method of mating, and (4) time of year.

Age to Breed Heifers

Heifers usually reach sexual maturity (come in heat the first time) at about 1 year of age. However, maturity varies among breeds and even individuals within the breed. A 1-year-old heifer is too young and too small to breed. Separate heifers at that age, or younger, from bulls to prevent accidental, premature breeding. Under no circumstances should a heifer be bred before at least 15 months of age.

Opinions differ among cattlemen and livestock experts as to just what age heifers should be bred. However,

there is general agreement that heifers should be well developed and weigh about 700 to 800 pounds before being bred. In fact, size or development probably is more important than age, because nature provides for the growth of the unborn calf even at the expense of growth and development of the mother. Hence, breeding heifers too young may cause them to be stunted and never reach normal size at maturity. There is also considerable evidence that the period of time the heifer is nursing the first calf has an even more stunting effect than does the period of pregnancy.

Most cattle producers want cows to drop their calves within a short period of one another. The calves then will be uniform in size at market time.

To meet this goal for calving, producers usually must choose between breeding their heifers to calve at about 2 years of age or 3 years of age. Some breed associations will not register a calf before the dam is 2 years old. Heifers bred to calve at 2 years of age often require assistance at calving time, and if they do not get help then, the calf or cow, maybe both, will die. On the other hand, the productive life of the cow is less, and cow-cost per calf raised during her productive life is greater if heifers are bred to calve at 3 years of age. This conclusion is substantiated by production records of cows calving at 2 years and 3 years of age at the Oklahoma Agricultural Experiment Station. See table 21.

Table 21. Production records at 8-1/2 years for cows calving at 2 years and 3 years of age, Oklahoma (1948-1956)

Item	Age at first calving	
	2-year olds	3-year olds
Number cows compared	60	60
Number possible calvings	384	338
Number calves weaned	350	298
Percent calf crop weaned	91.9	88.2
Number calves weaned per cow	6.4	5.3
Avg. weaning weight, pounds (corrected for age and sex)	477	487
Cow-cost per cwt./calf weaned	$10.02	$11.73

Source: Miscellaneous Publication No. 48, Agricultural Experiment Station, Stillwater, Okla. 1957.

These data show an economic advantage when heifers are bred to calve at about 2 years of age. The heifers

must be well developed, well fed, under good management, and under close supervision at calving time. The best answer might be to compromise at about 2-1/2 years of age if this timing would fit into the breeding program followed on the farm.

Heat Period

The length of the heat period (the time during which a cow will mate with the bull) is very short, usually 12 to 18 hours. Heat periods usually recur about every 21 days, but may vary from 18 to 23 days until a cow is bred or settled. Ovulation usually follows the end of the heat period by 6 to 18 hours, but the time required for the sperm to travel from the vagina to the oviducts where fertilization occurs is only a few minutes. Hence, a cow should be bred near the end of the heat period to be sure many vigorous sperm are present when the egg is liberated.

The heat period in a cow may usually be detected by her attempts to mount other cows, which in turn often mount her. Strange as it may seem, there is usually a regular pattern in heat periods. Cows usually come in heat late at night or early in the morning and go out of heat late the same evening or early night. Therefore, cows that are to receive a single service should generally be bred in the afternoon.

Method of Mating

The methods of mating discussed here are hand mating, and pasture mating. The relationship between the method used and the time when cows should be bred is obvious. Where hand mating is practiced, one must closely check the cow herd to be sure that a cow is taken to the bull for mating near the end of the heat period. Where pasture mating is practiced, such attention is not necessary because the bull will detect cows as they come in heat and serve them in the pasture, often repeatedly. Most cattle producers prefer this method. Heifers should not be allowed to run in the pasture with a bull until they are at least 15 months old, and preferably about 18 months of age.

Time of Year

The choice of a time or season of year to breed cows is highly controversial. Some cattle producers claim that fall-dropped calves perform the best. Others claim that spring-dropped calves are more economical. Still others insist on letting the bull run with the cow herd and have year-round calving, which will distribute cattle sales better and with less labor and attention. The time to breed is necessarily associated with the method of mating practiced.

Several factors should be considered in deciding what time of year your calves should be dropped: (1) percent calf crop, (2) cost of wintering cows, (3) age and weight of calf at weaning, (4) the program of marketing calves, (5) feed supply, and (6) available labor.

Factors that Affect the Percent Calf Crop

Percentage of calf crop as used here refers to the number of calves born alive per 100 cows of breeding age that were served by bulls during the preceding breeding season or year, whichever is shorter.

The possibility for profit in beef cattle production programs depends upon the production per cow--that is, the percent calf crop and the weaning weight per calf. Table 22 is a handy guide to determine the number of pounds of calf produced per cow in a herd. Read across from the average percent calf crop and down the column representing the average weaning weight.

Table 22. Pounds of calf per cow produced, at various percent calf crops and weaning weights

Percent calf crop	Average weaning weight in pounds						
	500	475	450	425	400	375	350
95	475	452	425	404	380	366	333
90	450	428	405	383	360	338	315
85	425	404	383	361	340	319	298
80	400	380	360	340	320	300	280
75	375	356	338	319	300	282	263
70	350	333	315	298	280	263	245

Source: Your Cow and Calf Business, B-956, Agricultural Extension Service, College Station, Texas; May 1960.

Question No. 75 Heifers usually reach sexual maturity at what age?____

Question No. 76 Differences of opinion exist on the age at which heifers should be bred; however, a good rule of thumb is that they should be at least _____ months of age, should be well developed and weigh from _____ to _____ pounds before being bred.

Question No. 77 What is the main disadvantage of breeding a heifer to calve at 2 years of age?_____

Question No. 78

A substantial economic benefit can be gained from breeding cows to calve at 2 years of age. In Oklahoma tests, what was the cow-cost per hundredweight of calf weaned, for 2-year-old calving as opposed to 3-year-old
calving over a period of 8-1/2 years?_____

In striving for maximum profit, cattle producers try to keep their annual production per cow as high as possible and the cow-costs as low as possible, consistent with good management.

Some factors that often affect the percent calf crop are:

a. Cows may be physically unable to conceive.

b. Cows may have some genetic weakness that affects regular reproduction. The heritability of reproductive performance is low.

c. The number of cows per bull may be too great. The number of cows a bull can successfully serve depends on the age of the bull and the method of mating, as previously discussed.

d. The fertility of the bull may be low--or the bull may be sterile--due to overwork, age, level of nutrition and management, or inheritance.

e. External and internal parasites of either the bull or the cow.

f. Diseases of the reproductive organs.

g. Size of the cow herd.

Several tests by the Mississippi Agricultural Experiment Station show that the level of nutrition provided by the wintering ration affects the percent calf crop. Results of a 5-year test conducted at State College, Miss., 1948-52, to determine the effect of wintering rations on the percent calf crop of mature Angus and Hereford cows are shown in table 23. Rations included: Group I--30 pounds sorghum silage, 5 pounds hay, 1 pound cottonseed meal; Group II--pasture clippings ad lib, 1 pound cottonseed meal; Group III--pasture clippings alone; Group IV--continuous winter grazing, oats or fescue; Group V--limited winter grazing, oats or rye, 3 hours daily.

Table 23. Effect of method of wintering beef cows on percent calf crop

Methods of wintering, by groups	Percent calf crops by years and 5-year average					
	1948	1949	1950	1951	1952	5-Year average
I	100	83	90	84	94	90
II	86	80	85	86	86	85
III	68	79	63	86	70	73
IV	78	92	94	88	90	89
V	91	84	93	90	73	87

Source: Mississippi Farm Research, Agricultural Experiment Station, State College, Mississippi. November 1953.

Note that the low level of nutrituion provided by pasture clippings alone reduced the calf crops of cows in Group III 12 to 17 percent less than cows in the groups with the better wintering rations.

On the other hand, tests by experiment stations in Oklahoma and Tennessee found that cows fed at high or very high levels of nutrition--rations similar to fattening rations for steers--produced a considerably smaller percent calf crop. These cows also had trouble at calving time, produced less milk, and weaned lighter weight calves than cows fed at a medium level of nutrition. These findings would not be of great concern to the commercial beef cattlemen, but might be of great significance for purebred breeders.

A survey in 1957-1958 by the Ohio Experiment Station found that herds larger than 75 cows produced a smaller percent calf crop than smaller size herds, even though the number of cows per bull was no more than in the smaller herds.

The Value of Pregnancy Testing

A cow must raise a calf every year to be profitable. Yet, farmers rarely get a 100 percent calf crop. A survey by the USDA in 1955 showed that less than 80 percent of the nation's beef cows produced calves every year. A calf crop of 90 percent is a reasonable average under good management.

When a cow fails to come in heat again after breeding, she is usually pregnant. However, some non-pregnant cows also fail to return to heat, and a few pregnant cows do return to heat. Nevertheless, this test of pregnancy is most commonly used.

More accurate tests of pregnancy could help hold down a producer's costs. Several experiment station

records show that the annual cost of keeping a cow in the herd varies from about $150 to nearly $250, averaging at $200.

The annual cost, of course, varies with the amount and cost of winter feeding, labor, pasture costs, etc. An accurate pregnancy test soon after breeding would allow a farmer to market a cow that failed to become pregnant, instead of feeding and caring for her a whole year with no possible money return. This might be the difference between profit and loss for a beef cattle producer.

A technique has been developed to determine pregnancy by the end of the second or third month. With proper training, one may examine the uterus through the rectum. The uterus and ovaries are just beneath the colon and can easily be felt through the wall of the large gut. If the cow is pregnant, the fetus can be easily felt with the hand.

This type of pregnancy test should be done only by a veterinarian or a trained technician. The cost usually runs about $1 to $2 per head, depending upon the size of the herd. This test is becoming increasingly popular. The savings made by culling and marketing just one open or barren cow might pay the expenses of pregnancy testing an average-size farm herd, particularly in commercial grade herds. However, in purebred breeder operations the removal of all cows that fail to produce a calf every year might not be desirable or profitable.

Several other tests may be used to determine pregnancy, but only in the later stages of pregnancy--from the fifth to the seventh month. These include: (1) listening for the fetal heart beat by placing an ear against the lower right abdominal region of the cow, (2) observing fetal movements through the abdominal wall, and (3) abdominal ballottement, or "fisting", the lower right abdominal region and feeling the fetus. These tests have little practical value because they are accurate only in the later stages of pregnancy, and the expenses of maintaining the cow in the herd for a considerable period will already have been incurred.

The gestation period of beef cows runs from about 270 to 290 days, with an average of about 283 days. Table 24 is based on this average.

Table 24. Gestation period of breed cows

Date bred	Date due	Date bred	Date due	Date bred	Date bred
Jan. 1	Oct. 11	May 7	Feb. 14	Sept. 3	June 13
Jan. 8	Oct. 18	May 14	Feb. 21	Sept. 10	June 21
Jan. 15	Oct. 25	May 21	Feb. 28	Sept. 17	June 27
Jan. 22	Nov. 1	May 28	Mar. 7	Sept. 24	July 4
Jan. 29	Nov. 8	June 4	Mar. 14	Oct. 1	July 11
Feb. 5	Nov. 15	June 11	Mar. 21	Oct. 8	July 18
Feb. 12	Nov. 22	June 18	Mar. 28	Oct. 15	July 25
Feb. 19	Nov. 29	June 25	Apr. 4	Oct. 22	Aug. 1
Feb. 26	Dec. 6	July 2	Apr. 11	Oct. 29	Aug. 8
Mar. 5	Dec. 13	July 9	Apr. 18	Nov. 5	Aug. 15
Mar. 12	Dec. 20	July 16	Apr. 25	Nov. 12	Aug. 22
Mar. 19	Dec. 27	July 23	May 2	Nov. 19	Aug. 29
Mar. 26	Jan. 3	July 30	May 9	Nov. 26	Sept. 5
Apr. 2	Jan. 10	Aug. 6	May 16	Dec. 3	Sept. 12
Apr. 9	Jan. 17	Aug. 13	May 23	Dec. 10	Sept. 19
Apr. 16	Jan. 24	Aug. 20	May 30	Dec. 17	Sept. 26
Apr. 23	Jan. 31	Aug. 27	June 6	Dec. 24	Oct. 3
Apr. 30	Feb. 7			Dec. 31	Oct. 10

Cow Herd Size That Will Justify Ownership of a Bull

As mentioned earlier, the maximum number of cows a bull can successfully serve depends upon the age of the bull, method of mating practiced, and care and management given the bull. No specific research is known that has been directed at finding out just what size cow herd will justify ownership of a bull. However, logically, the cow herd should be large enough to make maximum use of a bull. A good rule-of-thumb is that a bull can mate with about 25 to 30 cows under the pasture method of mating. This method is the most practical and commonly used practice of beef cattle producers. Hand mating is most commonly used by purebred breeders, who can therefore increase the number of cows per bull by about 50 percent--up to 35 to 45 cows.

In a profitable beef cattle enterprise, each calf pays for the annual cost of keeping its mother in the cow herd, plus its pro-rata share of keeping the bull in the herd. All earnings above these costs contributes to profit on the herd. Thus, a herd of only 10 to 15 cows--would incur such a high pro-rata annual bull cost per calf that there would be no reasonable hope for profit. In fact, a survey by the Ohio Agricultural Experiment Station in 1957-58 revealed a considerable net operating loss on herds of less than 25 cows.

The ownership of a bull should also be convenient.

Under most conditions, an owner could not maintain a herd of only 10 to 15 cows and jointly own a bull with a neighbor, because of the inconvenience and trouble of carrying either the bull or the cows back and forth for service.

A herd of less than 25 cows could seldom, if ever, justify ownership of a bull.

Under current price levels, good purebred bulls sell at $1,000 to $4,000, depending on the quality. What price can a farmer afford to pay for a bull? The answer depends largely on the quality of the cow herd, because the bull should, by all means, be at least equal, and in most cases superior, to the quality of the cows. Many cattle producers with grade herds use a good bull to improve the market grade of their calves by one full grade. The average grade price differential averages about 2 cents per pound.

Assuming that the average weaning weight of a calf is 400 pounds, then each calf produced by the bull would have an added value of $8. With a 90-percent calf crop from a 25-cow herd and 1 bull, the value of the bull would be $176 annually (22 calves x $8). Considering the normal practice of using a bull in the herd for 3 years, the value of the bull during this time would be $528 (3 x $176). These figures illustrate how you might figure out the real value of a good bull in your herd--hence, the price you could afford to pay.

Question No. 79 What is the average gestation period of beef cattle?

Question No. 80 If a cattle producer had a group of heifers born about February 1, 1980, on about what date should the heifers be bred, and on about what date would they be expected to calve?

Question No. 81 What is the average annual cost of keeping a cow?

Question No. 82 What is the cost of pregnancy testing by a veterinarian or a trained technician?

Question No. 83 If we assume a 100-head cow herd with an average performance of 80 percent calf crop, what would be the dollars and cents value of determining which 20 percent of the cows that would not bear calves?

Question No. 84 — The possibility for profit in beef cattle production programs depends upon the production per cow which is _____

Question No. 85 — If a rancher has only a 75-percent calf crop and markets 350 pound calves at 85¢ per pound, what would be the gross income per cow? _____

Question No. 86 — If this same rancher raises the level of the operation to get a 90-percent calf crop and produces 450 pound calves, what would be the gross income per cow, at 85¢ per pound? _____

Question No. 87 — If the annual maintenance cost per cow is $200 and the cash sale price is 85¢ per pound, how many pounds of calf has to be produced per cow merely to pay the maintenance cost of the cow? _____

Question No. 88 — Table 23 on page 91 illustrates the differences in calf crops that were obtained at different levels of winter feeding. From this table, give the difference in percentage of calf crops between the lowest level and the highest level in 1950: _____ and for the 5-year average: _____

Artifical Insemination

Artificial insemination or artificial breeding is a practice in which semen (spermatozoa) is collected from the bull artificially and transferred to the cows by a person called an inseminator or breeding technician.

Artificial insemination has been widely used with dairy cattle for a many years, and an estimated 6 million diary cows or more are annually bred artificially. This is about one-third of the nation's dairy cows. No doubt the use of superior sires in the artificial breeding of dairy cows has accounted largely for the marked increase in annual milk production per cow in recent years.

Artificial insemination was seldom used with beef cattle until a few years ago, for several reasons:

(1) Beef cattle usually stay in the pasture or on the range and are seldom housed or handled. In contrast, dairy cows are housed at least twice a day for milking. Thus, heat periods are more easily detected.

(2) An objective measurement of the value of increased productivity in beef cattle resulting from artificial breeding has only recently been developed through performance testing and progeny testing programs with beef sires. In contrast, milk production records of dairy cows have been kept by most dairymen for years.

Some of the advantages of artificial insemination are:

(1) The cost of obtaining the services of outstanding performance-tested bull can be reduced.

(2) It eliminates the cost, inconveniences, and possible danger of keeping a bull.

(3) Outstanding bulls can be used more extensively. Few top bulls are born. When a superior bull is identified, one that sires rapid- and economical-gaining calves, he should be given the widest use possible. Normally a bull serves no more than 20 to 50 cows, but with artificial insemination he could produce enough semen to service over 1,000 cows per year. This high rate of service has been made practical by techniques of diluting, freezing, and storing semen.

(4) Genetic improvement is greatly accelerated by artificial insemination programs. These programs permit faster testing of superior, progeny-tested sires. The rates of improvement could be increased by an estimated 50 percent or more for gain and efficiency of feed use, doubled for weaning weight, and nearly tripled for carcass traits.

(5) It provides an opportunity to breed a large number of cows in a short time, which will produce a calf crop uniform in age, size, and conformation.

(6) A more concentrated calving season may be secured. With good heat detection, more calves will be born during the first month of the calving season than the average for natural service.

(7) As we learn more about control of heat or estrous cycle we will be able to reduce the calving period and period of need for an inseminator, which will reduce costs.

(8) Better herd health protection occurs. Artificial insemination stops venereal contact. Such diseases as vibriosis, trichomoniasis, and vaginitis can be stopped.

(9) Artificial insemination simplifies cross-breeding. Many cattle producers cannot spare the extra time and expense to establish additional breeding pastures and to locate good bulls of two or three different breeds. These handicaps can be eliminated or reduced by artificial insemination.

Some of the disadvantages of artificial insemination are:

(1) A lot of time and labor are needed to closely observe the herd to detect cows in the best stage of heat for breeding. The tape-on heat detector pads work well as an aid for their pasture rider. Battery-operated, heat detector machines work well, but the cattle must be penned or be run through a chute.

(2) The process requires someone skilled in inseminating.

(3) A good communication system is needed if a trained inseminator is not available during the period of breeding and the services must be hired or contracted.

(4) A cow in heat and her calf may be hard to separate from the rest of the herd. Driving them to the barn or an inseminating chute station in the pasture may also be difficult.

(5) This system may accentuate the weakness of a poor sire because of the possible large number of his progeny.

The use of artificial insemination is now within the reach of nearly every cattle producer who wants it. Many reputable, artificial insemination organizations are equipped to collect, evaluate, process, freeze, and store semen or to provide semen from outstanding bulls. The conception rate with artificial insemination compares very favorably with natural breeding when a skilled technician performs the service and the cows are detected in the proper stage of heat.

Question No. 89 Under the pasture mating system as practiced in commercial cow-calf operations, one mature bull can usually service about _____cows.

Question No. 90 Is it practical or economically feasible to attempt to maintain a bull for a 10-15 cow herd?_____

Question No. 91 Why has artificial insemination not proven a

practical method of breeding under commercial range operations in the past?_____

_____

FEEDING BEEF CATTLE

The main reason for including beef cattle in many farming programs is that cattle can harvest acreages of forages--pasture and dry roughages--and convert them into gains better than most other classes of livestock. Much of the land that produces forage is not well suited for any other purpose because of the rough topography, soil erosion, and low fertility. The forage could not be profitably used and sold by the farmer except through beef cattle.

Farm animals may be divided into two distinct types on the basis of their digestive systems. First is the monogastric animals that have a single compartment stomach. The monogastric type includes swine, horses, and chickens. The second type is the ruminants which are cud chewing animals that have a compound stomach. The ruminant type includes cattle and sheep. Ruminants have a relatively large digestive system which enables them to use much larger amounts of forage. Ruminants have a much greater ability to digest roughage before it enters the intestinal tract, and the alimentary tract system is far more efficient in the use of crude fiber. This ability of ruminants to use large amounts of roughage depends upon the microbial reactions which take place in the rumen and to a lesser extent in the intestines. Most rumen micro-organisms can synthesize or build up proteins and vitamins.

The ruminant stomach consists of four distinct parts: (1) the rumen or paunch, (2) the reticulum or honeycomb, (3) the omasum or manyplies, and (4) the abomasum or true stomach.

The large size of the digestive system is evident from the capacities of the four compartments of the cow's stomach. The following capacities show the range of sizes, depending on ages and breeds:

Compartment	Gallons
Rumen	20 to 48
Reticulum	1 to 3
Omasum	2 to 5
Abomasum	2 to 5
Capacity	25 to 61

Digestion in Ruminants

The feeds consumed by ruminants are swallowed without much chewing. Saliva flows freely and moistens the dry materials, making them easier to swallow. The feed passes into the rumen and reticulum, which function as one unit. They act as a holding vat to store the feed for several hours while micro-organisms digest the feed. When the rumen is full the animal will wait about an hour and then start rumination or chewing the cud. The partly digested feed is forced up the esophagus into the mouth for further chewing or grinding by the back teeth and then returned to the rumen.

Roughages such as grass and hay must be ruminated or they cannot be digested. However, the grains or prepared feeds do not appear in the cud for rechewing.

In the reticulo-rumen, millions of micro-organisms live on the feed, breaking it down and building some of it into their own bodies. Digestion in the rumen accounts for about 70 to 85 percent of the total use of digestible dry matter. The rumen is an excellent fermentation vat because of the following characteristics:

1. A desirable temperature.

2. A buffered medium.

3. Proper mixing motions.

4. An anaerobic condition allowing bacterial action in the absence of oxygen.

5. A good nutrient supply.

6. Removes fermentation products.

When we feed cattle, we are actually feeding the micro-organisms in the rumen because cattle largely live on the micro-organisms and their products. This concept also explains why cattle sometimes go off feed when the type of feed is changed. A change in feed will cause a decrease in some and an increase in other micro-organisms. Until the micro-organisms catch up, the animal will be off feed for a few days.

Nutritive Requirements for Beef Cattle

The basic nutritive requirements of beef cattle fall into five categories: (1) protein (2) energy--carbohydrates and fats, (3) minerals, (4) vitamins, and (5) water.

Protein

Protein constitutes the greater part of the muscles, internal organs, cartilage and connective tissues, skin, hair, horns, and hooves. Ample protein is needed to replace the daily breakdown of these tissues of the body, as well as to provide for normal growth and development. Generally, the protein needs per unit of body weight are greatest for the growth of calves and for pregnant cows that are nursing calves. Older cattle require more protein for maintenance, but less for growth.

Energy

Carbohydrates and fats are the feed nutrients that furnish energy required for beef cattle. Very little fat exists in most feeds consumed by beef cattle, but fat furnishes 2-1/4 times as much energy per unit of weight as carbohydrates. Carbohydrates comprise about three-fourths of the dry matter in most feeds, including hay, silage, other forage, and grains. Energy is required to carry on the various body functions, including rumination and the digestive processes. After the energy requirements for maintenance are met, excess carbohydrates are used to put fat on cattle. Because roughages are so bulky, and incompletely digested, cattle can't consume enough to produce the amount of fat needed to finish them for market. Therefore, cereal grains and concentrated feeds are required in fattening rations.

All carbohydrates are made up of carbon, hydrogen and oxygen. Carbohydrate is an inclusive term for sugar, starch, and cellulose. It makes up about 75 percent of the dry matter of most plants.

Carbohydrates are important constituents for the production of body fat. The value of various feeds that are high in carbohydrates depends on how fully they are digested and on the net energy they furnish. This relationship explains why the value per pound of starch and the various sugars in carbohydrate feeds is about the same, while fiber has a much lower value because it is incompletely digested.

Specific nutritive requirements for beef cattle for many years have been expressed in terms of Total Digestible Nutrients (TDN). In recent years many nutritionists have changed to Digestible Energy (DE) Values. A formula for determining the DE value of feeds from existing TDN values is:

$$\text{Therms DE} = \frac{\text{Lbs. TDN} \times 454 \text{ grams} \times 4.41 \text{ kilocalories}}{1000 \text{ kilocalories}}$$

This formula is based on the assumption that each gram of TDN has 4.41 kilocalories of digestible energy.

Minerals

The mineral requirements for beef cattle are generally less critical than those of most other farm animals. Common salt (sodium and chlorine) is the only mineral that is most always deficient in beef cattle rations. Beef cattle should have access to salt at all times. Iodine may be deficient in some areas so it is a good idea to supply iodized salt or trace mineralized salt; it costs very little more than plain salt.

Calcium and phosphorous are very important minerals, constituting about 75 percent of the mineral matter in the entire bodies of cattle and about 90 percent of that in their skeletons. Most of the roughages and other feeds fed to beef cattle usually contain a sufficient supply of these minerals unless they are produced on soils deficient in calcium or phosphorous.

Many southern soils are deficient in these minerals so it is a good idea to provide them if a soil analysis indicates a need for them. They can be provided by steamed bone meal, defluorinated rock phosphate or dicalcium phosphate. A good arrangement is to use a two-compartment mineral self-feeder, with salt in one compartment and the calcium-phosphorous source in the other. A mixture of one-third salt and two-thirds calcium-phosphorous source many be used in a single-compartment mineral self-feeder, provided additional salt is available.

Provide salt in a loose form or in blocks, depending upon which is cheaper. If loose salt is used, protect it from the weather to prevent serious losses. Some cattle producers believe that beef cattle will not get enough salt if it is furnished only in block form. Cattle on pasture consume more salt than those in a dry lot. Cattle need more salt when grazing is lush. Older cattle require more salt than young cattle, particularly when wintered on an all-roughage ration. Most cattle need about 1.5 to 3 pounds of salt per month per head. Because some weathering loss usually occurs, about twice this amount should be made available. Many experiments have shown that cattle can consume much more than this amount of salt without any danger, especially when water is readily available.

Very rarely are other major minerals or trace minerals deficient in rations in the South. Be on guard against high-powered salesmen who want to sell you a complex mineral mixture at a high price, because it is not needed.

Vitamins

Although vitamins are essential for growth, maintenance and reproduction in beef cattle, vitamin A is the only one that is of much concern under usual conditions. Vitamin A does not occur as such in plants, but cattle can synthesize vitamin A from carotene which is found in all green plants and yellow corn. Hence, about the only conditions under which we might need to provide vitamin A would be during long feeding periods where nothing but weathered, poor quality roughage is fed. Good quality silage stored at the proper stage of maturity provides ample carotene. So does good quality green, leafy hay, especially legume hays, if stored less than 1 year.

Beef cattle can store considerable vitamin A and carotene in their bodies during the grazing season. They can draw upon this store when their rations are deficient in vitamin A.

Vitamin D, the sunshine vitamin, is usually of no concern because beef cattle normally stay in the pasture or on range the year round. Fortunately, beef cattle can synthesize their other vitamin requirements by the action of the micro-organims in the rumen.

Water

Though seldom considered a feed nutrient, water is probably the most essential nutrient for all animals. Clean, fresh water should be readily available for beef cattle at all times. Mature beef cattle need about 12 gallons of water per head daily. Younger cattle require proportionately less. Water needs will vary depending on the weather and kind of ration fed. Beef cattle need more water during the summer than they do in the winter. Certain rations also cause beef cattle to drink more water than normally; for instance, cattle on "hot" meal (salt-cottonseed meal mixture) drink extra amounts of water. When cattle are fed high moisture content rations such as silage, they usually drink less water.

Be sure that the water source is wholesome. Several dreaded diseases, including leptospirosis, may be spread by cattle that drink from contaminated water holes or ponds.

The importance of water is demonstrated by the fact that a starving animal may lose nearly all of its fat, half of its body protein, and about 40 percent of its body weight--and survive. In contrast, disorders in the body occur if 10 percent of its water is lost, and the loss of 20 percent usually results in death. Water is essential to digestion, assimilation, and elimination of waste products. Water is also necessary in most of the body's chemical reactions, and it aids in the regulation of temperature.

Question No. 92 What are the five basic nutritive requirements of beef cattle?

a. _____
b. _____
c. _____
d. _____
e. _____

Question No. 93 Why is the protein need per unit of body weight greater for growing calves and pregnant cows than for mature animals? _____

_____

_____

_____

Question No. 94 What are the two feed nutrients that furnish the energy required by beef cattle?

a. _____
b. _____

Question No. 95 The dry matter in most feed such as hay, silage, grain and other forage is approximately three-fourths carbohydrates. After the energy requirements for maintenance are met, excess carbohydrates can put fat on cattle. Why aren't these types of feed, with the possible exception of grain, used to finish cattle for the market? _____

_____

_____

_____

Determining the Value of Different Feeds

The best guide to the value of different feeds is provided by results of actual feeding experiments. A farmer wants to use the feeds which are cheapest, yet will meet the nutritive requirements of the cattle being fed.

The values of many feeds have been determined by feeding experiments with beef cattle. Other feeds are evaluated on the basis of their content of Total Digestible Nutrients (TDN) or Digestible Energy (DE), and general information that may be available.

One method of determining the economy of various feeds is to figure the cost per pound of TDN in each feed. This method will show you the cheapest source of TDN. This is a sound method of determining the value of different feeds when high-protein feeds cost no more than feeds that are high in other digestible nutrients. However, high protein feeds usually cost more than feeds low in protein and high in carbohydrates. Digestible protein usually costs more per pound than digestible carbohydrates. Hence, some method should be used which takes into consideration both the TDN and digestible protein contents of different feeds.

Another method to determine the economy of different feeds is to calculate the cost per pound of protein in addition to the cost per pound of TDN as outlined above. However, this method is often confusing and might not be used by most cattle producers to determine the value of feeds.

Daily Nutrient Requirements

The National Research Council, Washington, D.C. publishes a series of booklets on nutrient requirements of domestic animals. These publications were started in 1945 and have been revised about every 5 to 8 years. Table 25 shows the 1976 revision for daily nutrient requirements by weight of animal. Table 26 shows the composition of feeds commonly used in beef cattle rations on an as-fed basis and Table 27 on a dry basis (moisture free). Match the needs of a weight class of animal with the composition of a feed or combination of feeds and determine if the feed or feeds will meet those needs or if it should be supplemented.

By computing the feed values per ton and looking at the differences between prices and feed values the stock producer can come up with the most economical feed that will furnish the requirements for the livestock. Local costs per ton of feeds available in the community should be secured and used as a basis for determining comparative feed values of the various feeds.

Table 25. Daily nutrient requirements on beef cattle

Daily nutrients per animal												Nutrient concentration in diet (dry matter)						
Total protein (lb)	Digestible protein (lb)	Energy NE_m* (Meal)	Energy NE_g** (Meal)	Energy TDN (lb)	CA (lb)	P (lb)	Vitamin A (thousands IU)	Body wt. (lb)	Avg. daily gain (lb)	Dry matter (100%) per animal (lb)	Roughage (%)	Total protein (%)	Digestible protein (%)	Energy NE_M* (Meal)	Energy NE_g** (Meal)	Energy TDN (%)	CA (%)	P (%)
GROWING-FINISHING STEER CALVES AND YEARLINGS								300	0.0	5.6	100	8.6	4.7	.53	.00	57	.14	.14
								300	1.0	7.8	70-80	11.3	7.2	.60	.42	60	.39	.31
0.48	0.26	3.07	0.00	3.2	.008	.008	5	300	1.5	7.9	50-60	13.0	8.9	.71	.45	70	.53	.37
0.88	0.56	3.07	1.12	4.6	.031	.024	7	300	2.0	7.8	25-30	14.6	10.0	.82	.54	77	.68	.45
1.03	0.70	3.07	1.60	5.5	.042	.029	8	300	2.5	7.7	15	16.0	11.7	.94	.62	84	.81	.55
1.14	0.79	3.07	2.15	6.0	.053	.035	8	400	0.0	7.0	100	8.3	4.6	.53	.00	55	.15	.15
1.23	0.90	3.07	2.76	6.5	.062	.042	8	400	1.0	10.9	80-90	10.9	6.1	.56	.34	56	.28	.24
0.59	0.33	3.81	0.00	3.9	.011	.011	7	400	1.5	11.1	70-80	11.3	7.3	.60	.42	64	.36	.28
1.19	0.66	3.81	1.38	6.1	.031	.026	9	400	2.0	9.9	30-40	12.8	8.6	.80	.51	77	.52	.37
1.25	0.81	3.81	1.98	7.1	.040	.031	11	400	2.5	9.7	15	13.9	9.6	.94	.59	83	.64	.46
1.27	0.85	3.81	2.61	7.6	.051	.037	11	500	0.0	8.7	100	8.3	4.5	.53	.00	53	.15	.15
1.35	0.93	3.81	3.33	8.0	.062	.045	11	500	1.0	11.4	75-85	11.3	6.4	.56	.46	63	.27	.25
0.72	0.39	4.51	0.00	4.6	.013	.013	8	500	1.5	12.7	55-65	10.6	6.7	.74	.39	65	.31	.28
1.29	0.73	4.51	1.53	7.2	.031	.029	11	500	2.0	12.3	45-50	11.6	7.5	.74	.50	74	.41	.33
1.34	0.85	4.51	2.32	8.3	.040	.035	13	500	2.5	12.1	15	12.9	8.3	.94	.55	79	.49	.36
1.43	0.92	4.51	3.09	9.1	.051	.040	13	600	0.0	10.0	100	8.1	4.6	.53	.00	54	.18	.18
1.56	1.00	4.51	4.04	9.6	.060	.044	13	600	1.0	12.8	65-70	9.5	5.9	.60	.42	56	.26	.23
0.81	0.46	5.17	0.00	5.4	.018	.018	9	600	1.5	15.5	55-65	9.2	5.7	.71	.32	66	.26	.23
1.22	0.75	5.17	1.78	7.2	.033	.029	12	600	2.0	15.6	45-55	10.5	6.6	.74	.41	69	.31	.27
1.42	0.89	5.17	2.67	10.2	.040	.035	14	600	2.5	15.4	20-25	11.0	6.7	.82	.51	73	.37	.30
1.63	1.03	5.17	3.54	10.7	.049	.042	15	600	3.0	14.4	15	12.2	8.0	.94	.62	86	.46	.35
1.70	1.05	5.17	4.62	11.4	.057	.046	15	700	0.0	11.0	100	8.4	4.7	.53	.00	55	.18	.17
1.75	1.15	5.17	5.58	12.6	.066	.051	15	700	1.5	16.9	55-65	9.2	5.7	.71	.35	63	.24	.21
0.92	0.51	5.79	0.00	6.0	.020	.020	11	700	2.0	18.9	45-55	9.3	5.9	.71	.37	65	.26	.22
1.55	0.97	5.79	3.05	10.7	.041	.036	15	700	2.5	17.1	20-25	10.6	6.7	.82	.52	75	.32	.28
1.76	1.12	5.79	3.98	12.2	.049	.042	17	700	3.0	16.8	15	11.3	7.3	.94	.59	83	.38	.30
1.81	1.15	5.79	5.24	12.9	.055	.049	17	800	0.0	12.0	100	8.6	4.9	.53	.00	55	.18	.18
1.90	1.22	5.79	6.28	14.0	.064	.051	17	800	2.0	17.9	45-55	9.9	6.1	.74	.48	70	.27	.24
1.03	0.59	6.41	0.00	6.6	.022	.022	12	800	2.5	18.3	20-25	10.2	6.3	.82	.54	78	.28	.24
1.78	1.09	6.41	4.43	13.0	.044	.040	16	800	3.0	18.3	15	10.8	6.8	.96	.60	86	.31	.27
1.86	1.16	6.41	5.74	14.3	.051	.044	17	900	0.0	13.2	100	8.6	4.8	.53	.00	55	.18	.18
1.97	1.24	6.41	6.98	16.0	.057	.049	18	900	2.0	20.9	45-55	9.2	5.5	.74	.43	71	.22	.21
1.13	0.63	7.00	0.00	7.3	.024	.024	13	900	2.5	19.7	20-25	9.9	6.4	.82	.59	79	.26	.23
1.88	1.14	7.00	4.92	13.8	.046	.044	18	900	3.0	19.7	15	10.4	6.4	.98	.62	86	.28	.25
1.95	1.21	7.00	6.58	15.6	.051	.046	19	1000	0.0	14.2	100	8.4	4.8	.53	.00	55	.18	.18
2.04	1.27	7.00	7.48	17.1	.055	.049	19	1000	2.0	22.5	45-55	8.6	5.0	.74	.52	69	.20	.20
1.19	0.68	7.58	0.00	7.9	.026	.026	14	1000	2.5	22.1	20-25	9.4	5.7	.82	.53	80	.23	.22
1.94	1.13	7.58	5.32	15.5	.044	.044	19	1000	3.0	20.8	15	10.4	6.3	.98	.62	86	.25	.25
2.09	1.25	7.58	6.85	17.1	.051	.049	20	1100	0.0	15.4	100	8.6	4.9	.53	.00	55	.19	.19
2.16	1.32	7.58	8.21	17.9	.053	.051	20	1100	2.0	23.1	45-55	9.0	5.3	.74	.46	72	.18	.18
1.32	0.75	8.14	0.00	8.4	.029	.029	15	1100	2.5	22.9	20-25	9.3	5.6	.82	.56	83	.20	.20
2.09	1.23	8.14	5.60	16.5	.042	.042	23	1100	2.9	22.0	15	9.7	6.0	.98	.62	86	.22	.22
2.12	1.27	8.14	7.38	18.9	.044	.044	23											
2.15	1.33	8.14	8.87	20.6	.048	.049	23											
GROWING-FINISHING HEIFER CALVES AND YEARLINGS																		
0.48	0.28	3.06	0.00	3.2	.008	.008	6	300	0.0	5.8	100	8.3	4.8	.53	0.0	55	.14	.14
0.90	0.58	3.06	1.13	4.8	.031	.024	8	300	1.0	8.1	70-80	11.1	7.2	.60	.37	59	.38	.29
1.05	0.70	3.06	1.80	5.7	.042	.031	8	300	1.5	8.1	50-60	13.0	8.6	.71	.47	70	.52	.38
1.14	0.79	3.06	2.41	6.3	.053	.037	8	300	2.0	8.2	25-30	13.9	9.6	.82	.54	77	.65	.45
1.30	0.93	3.06	3.21	6.6	.064	.044	8	300	2.5	8.2	15	15.9	11.3	.94	.62	81	.78	.54
0.61	0.35	3.74	0.00	4.2	.011	.011	7	400	0.0	7.1	100	8.6	4.9	.53	.00	59	.15	.15
1.12	0.71	3.74	1.38	6.8	.029	.026	12	400	1.0	11.4	75-85	9.8	6.2	.57	.29	60	.25	.22
1.25	0.81	3.74	2.24	7.6	.031	.030	12	400	1.5	11.6	65-75	10.7	7.0	.67	.37	66	.27	.26
1.30	0.85	3.74	2.99	8.1	.051	.037	12	400	2.0	10.6	30-40	12.3	8.0	.80	.50	76	.48	.35

(continued)

*NE_m = Net energy required for maintenance.
**NE_g = Net energy requirement for gain.
***Average milking ability = 10-12 lbs. per day.

Table 25. Daily nutrient requirements for beef cattle

Daily Nutrients per Animal												Nutrient concentration in diet (dry matter)						
		Energy												Energy				
Total Protein (lb)	Digestible Protein (lb)	NE_m* (Meal)	NE_g** (Meal)	TDN (lb)	CA (lb)	P (lb)	Vitamin A (Thousands IU)	Body wt. (lb)	Avg. daily gain (lb)	Dry matter (100%) per animal (lb)	Roughage (%)	Total protein (%)	Digestible protein (%)	NE_m* (Meal)	NE_g** (Meal)	TDN (%)	CA (%)	P (%)
1.40	0.96	3.74	3.99	9.0	.062	.044	12	400	2.5	10.1	15	13.9	9.5	.94	.62	86	.61	.44
0.72	0.41	4.50	0.00	4.7	.013	.013	9	500	0.0	8.4	100	8.6	4.9	.53	.00	56	.15	.15
1.30	0.77	4.50	1.76	8.0	.029	.029	14	500	1.0	13.6	80-90	9.6	5.7	.56	.31	59	.21	.21
1.35	0.83	4.50	2.65	8.8	.040	.035	14	500	1.5	13.4	60-70	10.1	6.2	.69	.38	66	.30	.26
1.45	0.90	4.50	3.54	9.5	.048	.037	14	500	2.0	12.3	35-45	11.8	7.3	.80	.53	77	.39	.30
1.52	1.04	4.50	4.73	10.8	.055	.042	14	500	2.5	12.4	15	12.3	8.4	.94	.62	86	.44	.34
0.81	0.46	5.16	0.00	5.4	.015	.015	9	600	0.0	9.6	100	8.4	4.8	.53	.00	56	.16	.16
1.39	0.82	5.16	1.89	8.9	.031	.031	14	600	1.0	15.2	80-90	9.1	5.4	.56	.32	59	.20	.20
1.41	0.85	5.16	3.08	9.7	.037	.033	15	600	1.5	13.6	55-65	10.4	6.3	.74	.47	71	.27	.24
1.48	0.94	5.16	4.05	10.7	.046	.037	15	600	2.0	13.9	35-46	10.6	6.8	.82	.53	77	.33	.27
1.68	1.08	5.16	5.43	12.5	.055	.045	15	600	2.5	14.7	15	11.4	7.3	.94	.59	85	.37	.31
0.92	0.52	5.79	0.00	5.9	.020	.019	11	700	0.0	10.8	100	8.5	4.8	.53	.00	55	.18	.18
1.47	0.87	5.79	2.13	9.5	.028	.028	16	700	1.0	17.0	80-90	8.6	5.1	.60	.29	56	.16	.16
1.52	0.90	5.79	3.48	10.9	.035	.031	17	700	1.5	15.6	55-65	9.7	5.8	.73	.45	70	.22	.24
1.58	0.99	5.79	4.55	12.1	.042	.037	17	700	2.0	16.0	35-45	9.9	6.1	.81	.51	76	.26	.23
1.78	1.10	5.79	5.96	13.8	.051	.044	17	700	2.5	16.9	15	10.5	6.5	.94	.55	82	.30	.26
1.03	0.57	6.40	0.00	6.6	.022	.022	12	800	0.0	12.0	100	8.6	4.8	.53	.00	55	.18	.18
1.61	0.91	6.40	2.35	11.1	.033	.033	18	800	1.0	18.4	75-85	8.8	4.9	.60	.31	60	.18	.18
1.63	0.92	6.40	3.77	12.2	.033	.033	18	800	1.5	17.9	55-65	9.1	5.1	.71	.42	68	.18	.18
1.69	1.01	6.40	5.04	13.4	.037	.037	18	800	2.0	18.0	25-35	9.4	5.6	.80	.51	74	.21	.21
1.80	1.12	6.40	6.69	15.4	.044	.040	18	800	2.5	18.4	15	9.8	6.1	.94	.58	84	.24	.22
1.12	0.63	6.99	0.00	7.4	.024	.024	13	900	0.0	13.2	100	8.5	4.8	.53	.00	56	.18	.18
1.57	0.92	6.99	2.57	11.8	.033	.033	18	900	1.0	18.5	70-80	8.5	5.0	.60	.38	64	.18	.18
1.74	0.99	6.99	4.09	13.3	.035	.035	19	900	1.5	18.9	50-60	9.2	5.3	.71	.45	70	.19	.19
1.76	1.04	6.99	5.54	14.1	.037	.037	19	900	2.0	18.6	20-25	9.5	5.6	.86	.53	76	.20	.20
1.81	1.09	6.99	6.99	16.1	.042	.040	19	900	2.4	18.4	15	9.8	5.9	.94	.62	86	.23	.22
1.21	0.68	7.57	0.00	7.9	.026	.026	14	1000	0.0	14.2	100	8.5	4.8	.53	.00	56	.18	.18
1.71	0.98	7.57	2.77	12.6	.035	.035	19	1000	1.0	20.0	70-80	8.6	4.9	.60	.37	63	.18	.18
1.79	1.03	7.57	4.36	14.2	.037	.037	20	1000	1.5	20.1	55-65	8.9	5.1	.72	.45	71	.18	.18
1.83	1.06	7.57	5.98	15.7	.035	.035	20	1000	2.0	19.5	25-35	9.4	5.4	.86	.56	81	.18	.18
1.83	1.06	7.57	6.75	16.3	.042	.042	20	1000	2.2	18.7	15	9.8	5.7	.94	.62	86	.22	.22
DRY PREGNANT MATURE COWS - MIDDLE THIRD OF PREGNANCY																		
0.73	0.34	6.4		6.8	.023	.023	17	800		12.5	100	5.9	2.8	.49		52	.18	.18
0.79	0.37	7.0		7.4	.025	.025	18	900		13.6	100	5.9	2.8	.49		52	.18	.18
0.87	0.40	7.6		8.0	.027	.027	19	1000		14.8	100	5.9	2.8	.49		52	.18	.18
0.94	0.44	8.1		8.6	.029	.029	21	1100		15.9	100	5.9	2.8	.49		52	.18	.18
0.99	0.47	8.7		9.1	.030	.030	22	1200		17.0	100	5.9	2.8	.49		52	.18	.18
1.06	0.51	9.2		9.6	.032	.032	23	1300		18.0	100	5.9	2.8	.49		52	.18	.18
1.13	0.54	9.8		10.2	.034	.034	25	1400		19.1	100	5.9	2.8	.49		52	.18	.18
COWS NURSING CALVES - AVERAGE MILKING ABILITY - FIRST 3 TO 4 MONTHS ***																		
1.69	0.99	9.4		9.9	.054	.054	34	800		18.4	100	9.2	5.4	.49		52	.29	.29
1.78	1.05	9.9		10.5	.055	.056	36	900		19.4	100	9.2	5.4	.49		52	.28	.28
1.88	1.11	10.5		11.1	.058	.058	37	1000		20.5	100	9.2	5.4	.49		52	.28	.28
1.98	1.17	11.1		11.7	.060	.060	39	1100		21.6	100	9.2	5.4	.49		52	.28	.28
2.08	1.23	11.6		12.3	.062	.062	41	1200		22.7	100	9.2	5.4	.49		52	.27	.27
2.18	1.29	12.1		12.9	.062	.062	43	1300		23.8	100	9.2	5.4	.49		52	.25	.25
2.29	1.35	12.7		13.5	.063	.063	44	1400		24.9	100	9.2	5.4	.49		52	.25	.25

*NE_m = Net energy required for maintenance.
**NE_g = Net energy requirement for gain.
***Average milking ability = 10-12 lbs. per day.
Source: Nutrient Requirements of Beef Cattle,
Fifth Revised Edition, National Research Council, 1976

Table 26. Composition of feeds commonly used in beef cattle ration (as fed-basis).

	Dry matter	Total protein	Dig. protein	NE_m*	NE_g**	TDN	Fat	Crude fiber	Calcium	Phos-phorus	Potas-sium	Sodium	Sulfur
	%	%	%	Mcal/lb	Mcal/lb	%	%	%	%	%	%	%	%
CONCENTRATES													
Barley	89.0	11.6	8.70	0.86	0.57	74	1.9	5.0	0.08	0.42	0.56		
Corn													
Corn & cob meal	87.0	7.5	3.80	0.81	0.54	73	3.0	8.6	0.04	0.22	0.42		
Yellow Dent #2	89.0	8.9	6.70	0.92	0.60	81	3.9	2.0	0.02	0.31	0.30		0.14
Yellow Dent #3	86.0	8.7	6.50	0.89	0.58	78	3.7	2.0	0.02	0.25	0.27		0.13
Molasses													
Beet	77.0	6.7	3.80	0.71	0.48	68	0.2	0.0	0.16	0.03	4.77	1.17	
Cane	75.0	3.2	1.80	0.65	0.41	54	0.1	0.0	0.89	0.08	2.38		
Cane, dried	96.0	4.1	2.30	0.84	0.52	69	0.1	0.0	1.14	0.10	3.04		
Oats	89.0	11.7	8.80	0.70	0.46	68	4.5	11.0	0.10	0.35	0.37		
Sorghum													
Grain	89.0	11.1	6.00	0.79	0.53	74	3.0	2.0	0.04	0.31	0.34	0.04	
Grain (6-9% Protein)	88.0	7.0	4.00	0.76	0.50	71	2.6	2.0					
Wheat													
Bran	89.0	16.0	12.50	0.62	0.39	62	4.1	10.0	0.14	1.17	1.24	0.06	
Hard winter	89.1	13.0	10.20	0.87	0.57	78	1.6	2.7	0.05	0.40	0.51		
Soft winter	89.1	10.9	8.20	0.87	0.57	78	1.6	2.5	0.09	0.29	0.39		
PROTEIN SUPPLEMENTS													
Cotton seed meal													
Expeller	94.0	41.0	33.20	0.77	0.50	78	4.3	12.0	0.16	1.20	1.40		
Solvent	91.5	41.0	33.20	0.71	0.46	69	2.0	12.0	0.16	1.20	1.40	0.14	
Linseed meal	91.0	35.1	30.90	0.71	0.47	69	5.7	9.0	0.40	0.83	1.38		
Soybean													
Whole seed	90.0	37.9	34.10	0.98	0.62	85	18.0	5.0	0.25	0.59			
Meal, dehulled	89.8	50.9	45.80	0.83	0.56	75	0.8	2.8	0.26	0.62	2.02		
Meal, expeller	90.0	43.8	37.30	0.84	0.56	77	4.7	6.0	0.27	0.63	1.71		
Meal, solvent	89.0	45.8	39.00	0.78	0.53	72	0.9	6.0	0.32	0.67	1.97		
Urea (45% N)		281.0											
Urea (42% N)		262.0											
DRY ROUGHAGES													
Alfalfa													
Hay, early bloom	90.0	16.6	11.40	0.55	0.28	51	2.0	26.7	1.13	0.21	1.87	0.14	0.27
Hay, mid bloom	89.2	15.3	10.80	0.50	0.24	51	1.8	27.6	1.20	0.20	1.30		
Hay, mature	91.2	12.4	8.70	0.48	0.20	50	1.5	34.2					
Meal, dehyd.	93.0	17.9	14.00	0.55	0.29	58	3.0	24.3	1.33	0.24	2.49	0.09	0.30
Brome, smooth hay													
Early bloom	90.3	10.9	6.70	0.54	0.28	56	2.2	28.2					
Mature	92.8	11.0	4.60	0.49	0.20	54	2.8	31.7	0.40	0.20	2.56		
Clover hay, red	87.7	13.1	7.80	0.50	0.25	52	2.5	26.4	1.41	0.19	1.54	0.15	0.13
Corn stover	87.2	5.1	1.90	0.48	0.22	51	1.0	32.4	0.43	0.08			
Cotton seed hulls	90.3	3.9	0.20	0.42	0.08	37	1.4	42.9	0.14	0.10	0.76	0.02	
Fescue hay													
Early bloom	90.0	10.8	6.70	0.51	0.25	52	2.4	28.4	0.36	0.31	3.07	0.14	
Mature	90.0	7.5	3.80	0.50	0.23	51	1.8	30.5	0.34	0.21	1.98	0.13	
Grain sorghum stover	85.1	4.5	1.50	0.47	0.21	49	1.8	27.7	0.34	0.09			
Lespedeza hay													
Early bloom	93.4	14.5	9.70	0.53	0.25	54	3.9	27.6	1.15	0.23	0.93		
Full bloom	93.2	12.5	7.90	0.49	0.20	51	2.9	28.9	0.97	0.21	0.96		

(continued)

* NE_m = Net energy required for maintenance.
** NE_g = Net energy required for gain.

Table 26. Composition of feeds commonly used in beef cattle ration (as fed basis).

	Dry matter	Total protein	Dig. protein	NE_m*	NE_g**	TDN	Fat	Crude fiber	Calcium	Phos-phorus	Potas-sium	Sodium	Sulfur
	%	%	%	Mcal/lb	Mcal/lb	%	%	%	%	%	%	%	%
DRY ROUGHAGES													
Orchard grass hay													
Full bloom	89.2	11.1	6.60	0.49	0.23	51	3.2	19.5	0.40	0.33	1.85		0.23
Mature	90.4	7.1	4.30	0.49	0.23	51	2.4	34.3					
Soybean straw	87.6	4.8	1.50	0.34	0.00	33			38.60	1.39	0.05	0.46	
Sudan Grass hay	88.9	11.3	4.90	0.51	0.26	52	2.0	25.7	0.50	0.28	1.37	0.02	0.05
Wheat straw	90.1	3.2	0.36	0.42	0.08	43	1.5	37.4	0.15	0.07	1.00	0.13	0.17
FRESH FORAGE													
Brome													
Immature	32.5	7.2	5.40	0.22	0.14	22	1.4	7.3	0.20	0.18			
Mature	56.1	3.6	1.90	0.36	0.21	36	1.6	18.5	0.17	0.15	0.70		
Fescue tall													
April-May	20.9	3.9	2.80	0.13	0.08	14	0.7	5.5	0.08	0.07	0.71	0.03	
July-Aug.	35.3	3.0	1.60	0.22	0.13	23	0.7	12.0	0.13	0.08	0.79		
Sept.-Nov.	50.0	4.2	2.00	0.32	0.18	32	1.1	16.4	0.20	0.10	0.80		
Dec.-March	60.0	4.9	2.60	0.38	0.22	38	1.0	19.4	0.25	0.11	0.30		
Lespedeza													
Early bloom	25.0	4.1	3.00	0.17	0.10	17	2.0	8.0	0.44	0.05	0.28		
Mature	35.5	4.5	3.10	0.26	0.17	26	2.1	16.0	0.36	0.11	0.27		
Orchard grass													
Immature	23.9	4.4	3.20	0.15	0.09	15	1.2	5.6	0.14	0.12	0.63	0.01	0.05
Full bloom	29.9	2.5	1.50	0.19	0.11	19	1.0	9.9	0.07	0.07			
SILAGES													
Corn Dent													
Well-matured	40.0	3.2	1.88	0.28	0.18	28	1.2	9.8	0.11	0.08	0.42		
Early maturity	28.0	2.4	1.40	0.20	0.13	20	0.8	7.4	0.08	0.06	0.27		
Grass													
Legume	29.3	3.5	1.80	0.16	0.07	16	1.0	9.2	0.23	0.08			
Sorghum													
Grain	29.4	2.1	0.59	0.16	0.08	17	1.0	7.7	0.07	0.05			
Sorgo	26.0	1.6	0.44	0.15	0.07	15	0.8	7.0	0.09	0.05	0.32		
Sudan Grass	23.3	2.4	1.30	0.13	0.07	14	0.7	8.0	0.15	0.05	0.72		
MINERAL SUPPLEMENTS													
Bonemeal, steamed	95.0	12.1	8.20			15			29.00	13.60		0.46	
Dicalcium phosphate	96.0								22.20	17.90			
Limestone	100.0								35.84				
Monosodium phosphate	96.7									21.80		32.30	
Phosphate, defluorinated	99.8								33.00	18.00	0.09	3.95	
Sodium Sulfate												32.40	22.50
Sodium tripolyphosphate	96.0									24.94			

* NE_m = Net energy required for maintenance.
** NE_g = Net energy required for gain.
Source: This table is adapted from Nutrient Requirements of Beef Cattle, Fourth Revised Edition, National Research Council, 1970.

Table 27. Composition of feeds commonly used in beef cattle rations on a dry basis (moisture free)

	Dry matter	Total protein	Dig. protein	NE_m*	NE_g**	TDN	Fat	Crude fiber	Calcium	Phos-phorus	Potas-sium	Sodium	Sulfur
	%	%	%	Mcal/lb	Mcal/lb	%	%	%	%	%	%	%	%
CONCENTRATES													
Barley	89.0	13.0	9.8	0.97	0.64	83	2.1	5.6	0.09	0.47	0.63		
Corn													
Corn & cob meal	87.0	8.6	4.3	0.93	0.62	84	3.5	9.9	0.05	0.25	0.48		
Yellow Dent #2	89.0	10.0	7.5	1.03	0.67	91	4.4	2.2	0.02	0.35	0.34		0.16
Yellow Dent #3	86.0	10.1	7.6	1.03	0.67	91	4.3	2.3	0.02	0.29	0.31		0.15
Molasses													
Beet	77.0	8.7	5.0	0.93	0.62	89	0.3		0.21	0.04	6.20	1.52	
Cane	75.0	4.3	2.4	0.87	0.54	72	0.1		1.19	0.11	3.17		
Cane, dried	96.0	4.3	2.4	0.87	0.54	72	0.1		1.19	0.11	3.17		
Oats	89.0	13.2	9.9	0.78	0.52	76	5.1	12.4	0.11	0.39	0.42		
Sorghum													
Grain	89.0	12.5	6.7	0.89	0.59	83	3.4	2.2	0.05	0.35	0.38	0.05	
Grain(6-9% Protein)	88.0	7.9	4.5	0.86	0.57	81	3.0	2.2					
Wheat													
Bran	89.0	18.0	14.0	0.69	0.44	70	4.6	11.2	0.16	1.32	1.39	0.07	
Hard winter	89.1	14.6	11.4	0.98	0.64	88	1.8	3.0	0.06	0.45	0.57		
Soft winter	89.1	12.3	9.2	0.98	0.64	88	1.8	2.5	0.10	0.33	0.44		
PROTEIN SUPPLEMENTS													
Cotton seed meal													
Expeller	94.0	43.6	35.3	0.82	0.53	78	4.6	12.8	0.17	1.28	1.49		
Solvent	91.5	44.8	36.3	0.77	0.50	75	2.2	13.1	0.17	1.31	1.53		0.15
Linseed meal	91.0	38.6	34.0	0.78	0.52	76	5.2	9.9	0.44	0.91	1.52		
Soybean													
Whole seed	90.0	42.1	37.9	1.09	0.69	94	20.0	5.6	0.28	0.66			
Meal, dehulled	89.9	56.7	51.0	0.92	0.62	84	0.9	3.1	0.29	0.69	2.24		
Meal, expeller	90.0	48.7	41.4	0.93	0.62	85	5.2	6.7	0.30	0.70	1.90		
Meal solvent	89.0	51.5	43.8	0.88	0.59	81	1.0	6.7	0.36	0.75	2.21		
Urea (45% N)		281.0											
Urea (42% N)		262.0											
DRY ROUGHAGES													
Alfalfa													
Hay, early bloom	90.0	18.4	12.7	0.61	0.31	57	2.2	29.8	1.25	0.23	2.08	0.15	0.30
Hay, mid bloom	89.2	17.1	12.1	0.56	0.27	56	2.0	30.9	1.35	0.22	1.46		
Hay, mature	91.2	13.6	9.5	0.53	0.21	55	1.7	37.5					
Meal, dehydrated	93.0	19.2	15.0	0.59	0.31	61	3.2	26.1	1.43	0.26	2.68	0.10	0.32
Brome, smooth hay													
Early bloom	90.3	12.1	7.4	0.59	0.31	62	2.4	31.2					
Mature	92.8	11.8	5.0	0.53	0.22	58	3.0	34.2	0.43	0.22	2.76		
Clover hay, red	87.7	14.9	8.9	0.57	0.28	59	2.9	30.1	1.61	0.22	1.76	0.17	0.15
Corn stover	87.2	5.9	2.2	0.55	0.25	59	1.2	37.1	0.49	0.09			
Cotton seed hulls	90.3	4.3	0.2	0.47	0.09	41	1.5	47.5	0.16	0.10	0.84	0.02	
Fescue hay													
Early bloom	90.0	12.0	7.4	0.57	0.28	58	2.7	31.6	0.40	0.34	3.41	0.16	
Mature	90.0	8.4	4.2	0.56	0.26	57	2.0	33.9	0.38	0.23	2.20	0.15	
Grain sorghum stover	85.1	5.3	1.8	0.55	0.25	57	2.1	32.6	0.40	0.11			
Lespedeza hay													
Early bloom	93.4	15.5	10.4	0.56	0.27	58	4.2	29.6	1.23	0.25	1.00		
Full bloom	93.2	13.4	8.5	0.53	0.21	55	3.1	31.0	1.04	0.23	1.03		

(continued)

* NE_m = Net energy required for maintenance
** NE_g = Net energy required for gain

Table 27. Composition of feeds commonly used in beef cattle ration on a dry basis (moisture free)

	Dry matter	Total protein	Dig. protein	NE_m*	NE_g**	TDN	Fat	Crude fiber	Calcium	Phos-phorus	Potas-sium	Sodium	Sulfur
	%	%	%	Mcal/lb	Mcal/lb	%	%	%	%	%	%	%	%
DRY ROUGHAGES													
Orchard grass hay													
Full bloom	89.2	12.4	7.4	0.55	0.26	57	3.6	33.1	0.45	0.37	2.10		0.26
Mature	90.4	7.9	4.7	0.55	0.26	57	2.7	38.8					
Soybean straw	87.6	5.5	1.7	0.39		38		44.1	1.59	0.06	0.53		
Sudan Grass hay	88.9	12.7	5.5	0.57	0.29	59	2.2	28.9	0.56	0.31	1.54	0.02	0.06
Wheat straw	90.1	3.6	0.4	0.47	0.09	48	1.7	41.5	0.17	0.08	1.11	0.14	0.19
FRESH FORAGE													
Brome													
Immature	32.5	22.1	16.7	0.69	0.43	68	4.3	22.4	0.62	0.57			
Mature	56.1	6.4	3.3	0.64	0.37	65	2.9	33.0	0.30	0.26	1.25		
Fescue tall													
April-May	20.9	18.5	13.2	0.64	0.37	65	3.4	26.2	0.40	0.34	3.41	0.16	
July-Aug.	35.3	8.6	4.6	0.63	0.36	64	2.1	33.9	0.38	0.23	2.24		
Sept.-Nov.	50.0	8.4	4.5	0.63	0.36	64	2.2	32.8	0.39	0.20	1.59		
Dec.-March	60.0	8.2	4.4	0.63	0.36	64	1.7	32.4	0.42	0.19	0.50		
Lespedeza													
Early bloom	25.0	16.4	11.8	0.67	0.41	67	0.5	32.0	1.35	0.21	1.12		
Mature	35.5	12.8	8.8	0.74	0.48	73	0.7	44.9	1.02	0.31	0.77		
Orchard grass													
Immature	23.9	18.4	13.5	0.64	0.37	65	5.0	23.4	0.54	0.50	2.64	0.04	0.21
Full bloom	29.9	8.5	5.1	0.63	0.36	64	3.3	33.1	0.23	0.22			
SILAGES													
Corn Dent													
well-matured	40.0	8.1	4.7	0.71	0.45	70	2.9	24.4	0.27	0.20	1.05		
early maturity	28.0	8.4	4.9	0.71	0.45	70	2.7	26.3	0.28	0.21	0.95		
Grass													
Legume	29.3	11.8	6.0	0.54	0.23	56	3.4	31.4	0.78	0.28			
Sorghum													
Grain	29.4	7.3	2.0	0.55	0.26	57	3.3	26.3	0.25	0.18			
Sorgo	26.0	6.3	1.7	0.57	0.28	58	3.1	26.8	0.35	0.20	1.22		
Sudan Grass	23.3	10.2	5.6	0.58	0.29	59	3.1	34.4	0.64	0.23	3.07		
MINERAL SUPPLEMENTS													
Bonemeal, steamed	95.0	12.7	8.6			16	3.4	2.1	30.51	14.31		0.48	
Dicalcium phosphate	96.0								23.13	18.65			
Limestone	100.0								35.84				
Monosodium phosphate	96.7									22.46		33.40	
Phosphate, defluorinated	99.8								33.07	18.04	0.09	3.96	
Sodium sulfate												32.40	
Sodium Tripolyphosphate	96.0									25.98			22.50

* NE_m = Net energy required for maintenance
** NE_g = Net energy required for gain
Source: This table is adapted from Nutrient Requirements of Beef Cattle, Fourth Revised Edition, National Research Council, 1970.

Feeding Programs for Beef Cows

Pasture or range is the very foundation of any economical beef cattle production program. In the first place, many acres of farm land are devoted to pasture because they are not adapted to other uses, yet they will grow grasses and legumes. In the next place, pasture furnishes cheaper feed than any harvested crop. Good pasture management practices such as fertilization, weed control, and rotational grazing usually will increase profits from the beef cattle enterprise.

Most brood cow herds in the South are kept only to raise calves for beef. Therefore, the entire annual cost of keeping a cow in the herd must be charged against her calf at weaning time. Calves are usually weaned at 6 to 8 months of age. Brood cows must be maintained as cheaply as possible, yet they must be kept in thrifty, vigorous breeding condition. This calls for maximum use of pasture and other grazing as long as possible.

The normal growing season for most permanent pasture grasses and legumes extends from about April 1 to November 15, and during this period the pasture should furnish all the feed needed for the brood cows. Of course, this period will depend to some extent on the amount and distribution of rainfall, rate of stocking, pasture management and other factors. Each cow and her calf require about 3 acres of permanent pasture. Pastures should be cross-fenced so that while one area is grazed another area will have a chance to recover its growth. Thus,an ample supply of good grazing will be available all the time during the growing season.

On many farms, brood cows can get sufficient feed for their maintenance after frost in the fall and at least part of the winter by grazing stubble or stalk fields and idle land that has grown up in grass and weeds. Some permanent pastures make enough surplus growth in late summer and early fall to provide ample grazing of "frosted" or dead grass for a considerable period. As such grazing weathers it loses some of its feed nutrients, but it will provide enough bulk to fill the cows. Supplement such a ration with a high-protein concentrate such as cottonseed meal or cake or soybean meal, about 1 to 1.5 pounds per cow per day.

Thus, the only feeding problem with the brood cow herd is limited to the winter season. The seriousness or complexity of wintering cows varies widely from farm

to farm and from year to year, depending on factors already discussed.

If poor quality, non-legume roughage is the only feed, you should add about 1 pound per head, daily, of a high-protein concentrate such as cottonseed meal or soybean meal to meet the nutritive requirements. Bred beef cows should be fed sufficiently to keep them in a thrifty condition so that they will give birth to strong calves and produce enough milk for their rapid growth.

Whether or not the brood cows are dry during the winter feeding period depends upon the system of calving on any particular farm. Some farmers breed their cows to calve, from November to February; others want their calves dropped from February to April; and still others follow a year-round calving system. The system of calving will influence the type of winter feeding program required.

A good rule of thumb for feeding roughages to beef cattle is that a cow will consume about 3 pounds of hay or 9 pounds of silage per 100 pounds of body weight daily.

The nutritive requirements for brood cows nursing calves, particularly for the first 3 or 4 months, are considerably higher than for pregnant cows. The demands for milk production plus the loss in body weight at calving time account for the increased nutritive requirements.

Cows that calve in the fall and early winter must be fed a good wintering ration--much better than pregnant cows. Of course, cows that calve in the spring are usually able to meet their nutritive requirements by grazing the lush growth of pasture grasses and legumes that always occur with the season. The nutritive requirements of beef cows nursing calves during the winter may be provided by feeding a dry ration or by winter grazing crops. The most economical source is the primary factor in determining the choice of method of wintering.

Question No. 96 What are two terms that are used to express the specific nutrient requirements for cattle?

a. _____

b. _____

Question No. 97 What mineral is almost always deficient in beef cattle rations? _____

_____

Question No. 98 Name two other very important minerals that are usually deficient in the South:

a. _____

b. _____

Question No. 99 What is the most common way of providing the animals with calcium and phosphorus? _____

Question No. 100 Salt is very cheap and cattle should never be without it. The normal requirement of salt by cattle is from _____ to _____ pounds per head per month. However, because some weathering loss usually occurs, about _____ this amount should be made available.

Question No. 101 What is the only vitamin that may be found deficient under usual conditions? _____

Question No. 102 What are the circumstances under which this vitamin may be deficient, and how can you compensate for it? _____

Question No. 103 What is the most essential nutrient for all animals and what is the usual daily requirement for mature beef cattle? _____

Question No. 104 What is one hazard caused by cattle drinking from contaminated water holes or ponds? _____

Question No. 105 What are the two most common concentrates fed in the winter and what are their digestible protein and TDN percentages?

a. _____

b. _____

Question No. 106 The amount and type of concentrate livestock will need during fall and winter months depends on the native forage that is available; however, what is one usual daily ration of cottonseed meal or cake, or soybean meal? _____

Supplemental Feeding on Forested Ranges

Almost all woodland range forages and most unfertilized native pasture forages in the South are seriously deficient in nutrients during the fall and winter. These range forages must be supplemented if cattle are to thrive and have adequate calf crops. Without supplements, susceptibility to parasites and disease is high. Malnutrition results in heavy death losses, average calf crops seldom exceed 50 percent, and weaned calves frequently weigh less than 300

pounds. These conditions are not conducive to a profitable livestock operation.

Range or native forage is most nutritious in spring and summer; cattle weight gains are highest then. During this period, mature cows from herds grazing bluestem range and producing 75 to 80 percent calf crops gain an average of about 165 pounds each. Pineland threeawn forage is not as nutritious as bluestem forage in the summer; cows grazing the threeawn gain less. In Georgia, dry cows on pineland threeawn range gain about 155 pounds during spring and summer. Wet cows do little more than maintain body weight, and may lose 50 pounds or more per head during this time. Nutritive value of the forage declines in fall and winter. Even when fed protein and mineral supplements, cows that calve during the winter will lose about 200 pounds on bluestem range. Dry cows generally lose less than 75 pounds. Pineland threeawn forage is so low in nutrients during the winter that cattle are taken from the range and put in feedlots or on improved pasture.

The range manager can influence forage quality considerably by controlling the closeness of grazing and making prescribed burns. The quality of range forage is judged by protein and mineral content and by digestibility. On pineland threeawn ranges in Georgia, grass contains about 6 percent crude protein in spring. If the range is burned in the winter, the spring forage will contain 10 to 12 percent protein. Three to four months after grass growth begins, the crude protein for pineland threeawn will fall below 6 or 7 percent, which is less than the minimum needed by a cow that is nursing or carrying a calf.

New grass growth on unburned bluestem range normally contains 8 to 9 percent crude protein in the spring. On ranges burned in late winter or early spring, the percent will be from 10 to 12. In July and August protein content is about 7 percent, or slightly higher if summer and fall brings on new growth. In the winter it may fall to 3 or 4 percent.

Repeated grazing has much the same effect as burning in increasing the succulence and protein content. Cattle continually seek out plants previously grazed. In Louisiana, bluestem forage that was frequently harvested contained 9 to 11 percent crude protein, while that on unharvested plots had 5 to 6 percent. Forbs, especially legumes, are often higher in protein than grasses. Phosphorus is the mineral most often deficient in native forage.

Livestock on wooded ranges must be fed concentrates or hay during periods when range forage is low in nutrients. Concentrates are feeds that are low in fiber and high in total digestible nutrients. Some commercially or home-grown feeds available to the livestock operator include various grains, wheat bran, cottonseed meal or cake, linseed meal, bonemeal, etc. All so-called concentrates are not necessarily high in protein or in the necessary minerals needed for livestock, and many concentrate mixtures contain minerals that are not needed. Livestock operators should have their own situations appraised to determine the specific nutrient deficiencies common to their areas, and purchase concentrates and minerals to fill this need.

In the South, on wooded range and on unfertilized native pasture, phosphorus and calcium should be accessible in feedboxes all year. Steamed bonemeal (32 percent calcium, 15 percent phosphorus) is most widely used and with good results. To induce consumption and prevent spoilage, two parts of meal are often mixed with one part salt. Yearly consumption of this mineral mix varies from 18 to 75 pounds per head according to weather, quality of forage and mineral content of other feeds. Where the concentrate is fed with salt it can be fed free choice in boxes or portable feeders.

Good quality hay is also used as a supplemental feed and is widely used during fall and winter. Feeding locations should be moved periodically to avoid damage to the immediate area around the feeding equipment.

Question No. 107 Why should supplements be fed on forested ranges?_____

Question No. 108 Name four commonly used supplements that are used with woodland range.

a. _____ c. _____

b. _____ d. _____

Feeding Programs for Suckling Calves

Most practical cattle producers permit cows and calves to run together in the pasture all the time. Cows are expected to produce enough milk for the growth and development of a heavy calf at weaning time with no additional feed for the calves. This practice depends upon the season of calving and the mothering ability

or milking qualities of individual cows. Environmental factors also play a role. An abundance of good, green forage stimulates milk production and promotes rapid growth of calves.

The economic feasibility of using any feeding program with suckling calves to supplement their mother's milk is questionable. However, in certain situations such a feeding program would be desirable or necessary. For instance, calves that are to be fitted for showing must be rapidly developed and carry a high degree of finish. The same might be true of purebred calves that are to be sold as breeding stock, because some cows in breeding herds do not produce enough milk to raise a beefy calf.

If supplemental feeding of suckling calves is necessary or feasible, there is a choice of three methods: (1) winter grazing, (2) creep feeding, or (3) nurse cows.

Winter Grazing

This program applies only to fall- or winter-dropped calves. Seeding winter grazing crops on permanent pastures may be a practical and profitable source for part of the winter ration for the cow herd, and provide supplemental grazing for calves.

Creep Feeding

A creep might be described as an opening through which calves can pass, but cows cannot, to an enclosure for feeding purposes. The feeds used in a creep feeding program may consist of a prepared ration or winter grazing.

Many experiments to determine the value of creep feeding, produced results that did not agree. Some tests have shown creep feeding to be profitable; others have not. Several factors influence the results: (1) season of calving, (2) amount and quality of grazing available, (3) winter feeding level of brood cows, and (4) whether calves are to be sold as slaughter calves or as feeder calves.

Under Southern conditions, calves dropped in late winter or early spring would not profit from creep feeding if plenty of good grazing is available until weaning time. Often, calves at weaning time will sell at a higher price as feeders than they will as slaughter calves even when they are carrying a rather high finish. Yet, some feeders prefer to buy calves that do not carry a high degree of finish because they have to pay less per head for them. Too, some feeders may rough their calves through the winter and put them on a fattening ration in the spring.

Oklahoma Test - Creep Feeding Fall Dropped Calves - A test was started in the winter of 1954-55 to study the value of creep feeding suckling calves born in the fall and sold as feeder calves; also to study the relationship between the level of winter feeding of cows and creep feeding their calves. A herd of grade Hereford cows was uniformly divided in four lots averaging 18 to 20 cows per lot during the 4-year test. The cows and calves in the different lots were fed the following winter rations while on native grass pasture:

Lot 1 - 1.5 pounds of pelleted cottonseed meal; calves not creep fed.

Lot 2 - 1.5 pounds of pelleted cottonseed meal; calves creep fed.

Lot 3 - 2.5 pounds of cottonseed meal and 3 pounds of grain (milo or corn); calves not creep fed.

Lot 4 - 2.5 pounds of cottonseed meal and 3 pounds of grain (milo or corn); calves creep fed.

Creep Ration - 55 percent rolled milo, 30 percent whole oats, 10 percent cottonseed meal, and 5 percent cane molasses.

The cows were on the wintering ration from about November 1 to April 18 each year. The calves were dropped about November 1 each year. The creep ration was made available about mid-December, but little was consumed until late January. A mineral mixture of 2 parts salt and 1 part steamed bonemeal was available at all times. The average results show creep feeding decreases profits at both levels of wintering. The average loss from creep feeding calves of cows wintered at a low level was $2.33, while the loss from creep feeding calves of cows wintered at a high level was $11.29. The creep-fed calves were fatter and heavier at weaning, but the increase in value was not enough to pay for the creep ration consumed. The weight advantage of the creep-fed calves was gained largely before pastures started growth in the spring. After spring grazing became available the rate of gain differed little between the creep-fed calves and those not creep-fed.

If creep feeding is practiced, put the creep near a water hole or salt station where cows usually loaf, because calves always stay near their mothers. The creep feeding equipment should protect the feed from the weather to prevent loss of feed.

Nurse Cows

Foster mothers, or nurse cows, have no place in a commercial beef production program. A brood cow which did not produce enough milk to wean a growthy, heavy calf should be culled.

However, nurse cows are often used in purebred operations. Breeders often use nurse cows to develop calves whose mothers are poor milkers, so that the calves will be large for their age and carry a high degree of finish when being offered for sale. Too, some very valuable, highly bred cows are maintained in the herd until they get too old to produce much milk. The use of nurse cows in purebred operations may or may not be justified. Even though calves raised on nurse cows grow off more rapidly and sell for a higher price, the cost of keeping a nurse cow greatly increases the cost of raising a calf. Nurse cows are usually dairy cattle, such as Holsteins, that produce large quantities of low-fat milk. Calves on nurse cows may grow so rapidly that unsoundnesses often develop in the calves' feet and legs.

Calves that are being fitted for showing are often put on a nurse cow because of the need to be finished to the maximum degree to win. Thus, the use of nurse cows would seem to be limited to special cases and would not be practical for most cattle production programs.

Winter Grazing for Finishing or Feeding Slaughter Cattle

Small grains or grasses used for winter pastures must be seeded early and fertilized liberally for best grazing. Over-grazing must be avoided. The cost of good winter pastures is relatively high, and because of the high cost per acre they are generally recommended only for the fattening of good quality beef type steer calves and for dairy cows in production.

Feeding Program for Finishing Slaughter Cattle

Feeding out or finishing slaughter cattle for market is a highly specialized business and requires skill that is usually acquired only through experience. The main reason to consider finishing cattle for market is usually to use farm grown feeds--grains and roughages. A study of the nutritive requirements for fattening or finishing different ages of cattle as listed in table 22 (page 89) shows that the requirements for protein and TDN are about twice those for maintenance and normal growth. The energy feeds--primarily grains--are usually most important in fattening cattle. Thus, most of the cattle that are finished for market are fed in the Corn Belt States and the States that produce large quantities of

other cereal grains and grain sorghum. Of course, a fattening ration must be balanced to furnish all the nutrients needed in their proportions.

Most farms in the South generally produce a lot more forage--pastures and roughages--than grain. Hence, any feeding program for finishing slaughter cattle must use to advantage large amounts of roughages. In addition, to put enough finish on cattle for market demands, grains and protein concentrates must generally be fed in the ration.

No single feeding program is best for finishing slaughter cattle. The feeding program must be adjusted to individual farm situations. Factors to consider in determining a feeding program include: (1) kind of cattle--age, size, condition, and quality; (2) length of feeding period; (3) feeds available--pasturage, hay, silage, and grains as to kind, quality, and amount; (4) price of cattle--present and prospective price at time of marketing; and (5) price of feeds that might have to be bought, particularly grains and protein concentrates.

Finishing on Pastures vs. Dry Lot

Two methods are used to fatten or finish slaughter cattle: (1) pasture and (2) dry lot. The feeds used in all fattening rations fall into two groups: roughages and concentrates. Roughages include pasturage, hay, silage, stover, crop by-products such as cottonseed hulls and citrus pulp, cereal straws, etc. Concentrates include grains such as corn, oats, wheat, grain sorghum, etc., and protein feeds such as cottonseed meal, soybean meal, and linseed meal.

A farmer who has abundant pastures could use this forage as the roughage part of the ration and feed the concentrate part of the ration while the cattle are on pasture. If the pasturage is of good quality, consisting of a grass-legume mixture, cattle may be fattened to Good or Low Choice grade without any supplemental concentrates. Older cattle generally fatten on pasture to best advantage.

A farmer who has highly productive, but limited land and very little pasture, most likely would produce grain crops and silage or other harvested roughage crops and thus secure the greatest returns per acre by finishing out slaughter cattle in a dry lot.

Advantages of Fattening Cattle on Pasture

Advantages include:

1. Pasture gains are cheaper. Usually, less

grain and protein concentrates are required per pound of gain.

2. Pasture grass is the cheapest form of roughage. Harvested roughages always cost more.

3. Less labor is required in feeding. Usually, the only labor required is for feeding concentrates once a day. Generally, no other roughage needs to be fed. In the summer the weather is usually good, and the grain supplement could possibly be fed in a self-feeder without any shed over it.

4. The manure produced by the cattle is spread by the cattle themselves.

5. Summer-finished cattle are marketed in late summer or early fall when prices for fat cattle are higher than in any other season of the year.

Disadvantages of Fattening Cattle on Pasture

Disadvantages include:

1. Cattle usually take longer to finish.

2. Cattle fattened on pasture usually sell for less, partly because of prejudice of buyers. Pasture-fattened cattle are sunburned and do not look as good as cattle finished in a dry lot.

3. Summer heat and insects may slow gains.

4. An adequate supply of pasture grass is uncertain because of unfavorable weather conditions. Droughts are rather frequent and often severe enough to seriously damage summer pastures.

5. If the cattle to be finished on grass are not raised by the farmer, they would have to be bought in the spring when feeder cattle are scarce and high in price, or they would have to be bought in the fall and wintered on the farm.

6. Grain may be scarce and higher in price during the summer and early fall.

Generally, the advantages and disadvantages of dry lot feeding are just the reverse of pasture finishing. However, when cattle are to be finished in a dry lot, getting them on feed is a problem. Care must be used to get the cattle adjusted to being

penned, and they must be started on a small amount of feed, gradually increasing the amount each day or two until they are on full feed or the planned daily ration. Otherwise, the cattle may become sick with digestive disturbances. The cattle must get on the fattening ration as soon as possible, but in a way that assures they will not get sick or go off feed.

Question No. 109

What are the two methods used for fattening or finishing slaughter cattle?

a. _____

b. _____

Kind of cattle refers to age, size, condition and quality. The kind of cattle influences the feeding program that should be used in finishing slaughter cattle.

Calves and short yearlings cannot use great quantities of roughage, whereas older cattle can use great quantities, even if it is of poor quality. Young cattle gain at a faster rate than do older cattle because they are growing. Thus, a longer time is required for young cattle to put on finish. Older cattle that have about reached mature size use their feed for maintenance and putting on fat rather than for growth.

Young cattle require higher quality feeds than do older cattle. Weanling calves of good quality may be finished to Good slaughter grade on winter grazing crops. High quality cattle, because of their breeding and body conformation, do better than do poor quality cattle on rations consisting of a high grain and protein concentrate content. Poor quality cattle, including those with some dairy breeding, just won't ever finish out much higher than about Standard slaughter grade; therefore, they are adapted for only short feeding periods and mostly roughage rations, with limited, if any, grain or other concentrate feed.

Compared to young cattle in good condition, older cattle and cattle in thin condition usually gain more rapidly and more efficiently use permanent pasture and high-roughage-content rations. These kinds of cattle are often grass-fattened and marketed in late summer directly off permanent pasture.

Length of Feeding Period

Such a close relationship exists between the length of feeding period and the type feeding program used in

finishing slaughter cattle that either one may determine the other. Cattle that are fed concentrates for less than 120 days are usually called short-fed cattle. Cattle that are fed a finishing ration for 180 to 240 days are called long-fed cattle.

The amount of high energy feeds, grains and protein concentrates in the ration is also closely related to the length of the finishing period. The ration may vary from a full feed of concentrates, usually from 1.5 to 2 pounds for each 100 pounds of body weight daily, to a limited feed, usually from 2 to 8 pounds per head daily. When we refer to cattle being full-fed, we mean that they are being fed a ration free-choice, or all they will eat. Cattle are full-fed to finish them quickly and to be sure they put on enough fat to meet the market demands. Full-feeding is nearly always used when cattle are short-fed. Full-feeding cattle for long periods of time is seldom profitable except with weanling calves or short yearlings, because older and fatter cattle gain slowly, which makes the cost of gain higher.

Limited feeding is often practiced to take full advantage of the roughage (pasture, hay, silage, etc.) part of the ration. The gains during the finishing period are thereby made at lower cost. Limited feeding of concentrates is often practiced when cattle are fattened on pasture.

Missouri Test - Cattle Full at Various States - This series of tests was planned to show the relationship between age and length of feeding period. The tests involved different systems of management--wintering, use of permanent pasture, and fattening periods--so that all cattle were finished out at Good market grade.

For full feeding the cattle were put in dry lot and fed a ration of 10 parts of shelled corn to 1 part cottonseed meal with legume hay as roughage in summer and legume hay and silage in winter feeding.

The first lot to be full fed was started early in the winter of 1938 when calves were about 8 months old. The results are shown below:

On full feed	168 days	Shelled corn consumed	28 bu.
Initial weight	425 lbs.	Cottonseed meal consumed	157 lbs.
Final weight	799 lbs.	Legume hay consumed	525 lbs.
Avg. total gain	374 lbs.	Corn silage consumed	1,250 lbs.
Avg. daily gain	2.2 lbs.	Carcass grade	Low-Good
		Dressing percentage	57.83%

The second lot of cattle to be placed on full feed were short yearlings which had been wintered on corn silage and legume hay and were fed from April 27 to September 4, 1939. The results for this lot were:

On full feed	130 days	Shelled corn consumed	29 bu.
Initial weight	524 lbs.	Cottonseed meal consumed	160 lbs.
Final weight	857 lbs.	Legume hay consumed	897 lbs.
Avg. total gain	333 lbs.	Carcass grade	High-Good
Avg. daily gain	2.56 lbs.	Dressing percentage	59.36%

The third group of cattle was placed on full feed in January 1940, when about 20 months of age (long yearlings). The steers had been wintered on corn silage and legume hay and grazed through the summer and fall of 1939. They were full fed in dry lot from January 2 to April 22, 1940. The steers were finished out as 2-year olds. The results were:

On full feed	112 days	Shelled corn consumed	24 bu.
Initial weight	768 lbs.	Cottonseed meal consumed	135 lbs.
Final weight	1,046 lbs.	Legume hay consumed	446 lbs.
Avg. total gain	278 lbs.	Corn silage consumed	1,997 lbs.
Avg. daily gain	2.48 lbs.	Carcass grade	High-Good
		Dressing percentage	60.81%

The fourth group of cattle was placed on full feed in July 1940, when about 27 months old. The steers had been wintered on corn silage and hay through two winters, grazed one season on small grain-lespedeza and bluegrass pasture and also a part of the second grazing season on small grain-lespedeza pasture. They were full fed in dry lot from July 15 to September 16, 1940. The results for this group were:

On full feed	63 days	Shelled corn consumed	18.75 bu.
Initial weight	1,035 lbs.	Cottonseed meal consumed	105 lbs.
Final weight	1,189 lbs.	Legume hay consumed	590 lbs.
Avg. total gain	154 lbs.	Carcass grade	Middle-Good
Avg. daily gain	2.44 lbs.	Dressing percentage	59.07%

In summary, these tests show:

1. As the age of cattle increased, the length of the feeding period, or the time required to produce carcasses that would grade Good, decreased.

2. There was not much difference in the amount of grain required to finish the same quality cattle to the same market grade regardless of age or length of feeding period This finding applies to cattle that were in the same condition of flesh at the beginning of the finishing period.

3. The amount of protein concentrate required decreased as the age of the cattle increased. Young cattle require relatively more protein supplement than older cattle because they are still growing.

4. More beef was produced with a given amount of corn in older steers, even though young steers make 100 pounds of gain on less grain than older cattle. This was because older cattle had made considerable growth and gain on pasture and roughage before grain feeding began.

5. Marketing at a later age permitted the greater use of pasture and roughages.

Feeds Available

The amount and kinds of roughages and grain influence the choice of a finishing program. Protein concentrates always have to be bought, so they are not considered among the options. All finishing programs should be designed to make maximum and efficient use of the feed supplies--pasture, hay, silage, grains--produced on the farm. For this reason, feeding programs must be flexible. For instance, if there is plenty of harvested roughage and plenty of good permanent pastures, the most economical program may consist of roughing the calves through the first winter, putting them on pasture the following summer and finishing them out during the fall and winter to Choice grade, with about a 90-day fattening period. They may be carried through the second winter on roughage, put on pasture until about midsummer and then on a fattening ration of grain and protein concentrates on pasture or in a dry lot for a 60- to 90-day finishing period.

Thus, we see a close relationship between the kind of cattle, length of feeding period, and feed supplies available.

There is greater opportunity for flexibility in the beef cattle industry in the South than in any other section of the United States. In the past, the major part of the beef produced in this section has been marketed as milk-fat calves in the fall of the year. This timing has put the calves on the market when the bulk of grass-fat cattle are being sold, thus hitting the seasonal low prices.

In recent years, winter grazing has increased in popularity, and many cattle producers, rather than accept those low fall prices, have put their calves on grass after weaning and sold them as grass-fat yearlings in May or June. It is not uncommon for high quality cattle to reach a grade of High-Good or Low-Choice on good winter grazing crops by the time those crops stop growing in late spring. However, the uncertainty of winter grazing may not always enable you to depend on producing Choice beef at that season.

Also, some buyers still discriminate against grass-fat cattle because of the animals' yellow fat. Therefore, when the price relationship between grain and beef is favorable, a producer may be wise to grain-feed the high quality cattle until they reach the Choice grade.

A 2-year test was conducted during the summers of 1952 and 1953 to determine the length of feeding period necessary for yearling steers to reach Choice grade after coming off grass. High quality Hereford and Angus steers were grazed each year on various combinations of grasses and legumes until late June, when they were taken off grass and divided into three lots according to breed, weight, grade, and previous treatment. The three Lots were fed approximately 60, 90, and 120 days each year in a dry lot. They were full-fed a ration of ground shelled corn, cottonseed meal, and mixed grass hay. The tests produced these conclusions:

1. Grass is still the most economical feed. Any time High-Good to Low-Choice steers can be marketed off grass, the feeding of grain seems unprofitable.

2. High quality yearling steers grading High-Commercial to Low-Good can be pushed into the Choice Grade with a short feeding period of 75 to 90 days. Shorter feeding periods are insufficient to raise the grade of yearling steers to Choice. Gains above the Choice Grade are expensive and their returns are small or negative.

3. The low average daily gains for Lot I each year can be attributed to the hot weather in July and August. Cattle don't fatten as well in hot weather as they do in cool weather.

4. Steers taken off grass in June or July and short-fed for 90 days will reach the market when the price of fed cattle is normally the highest.

5. High quality steers are essential in any grain feeding program. Low quality steers are best marketed off grass.

6. The low net profit per steer in this test was due to a poor price relationship, or declining market.

Concentrates

Concentrates consist of cereal grains such as corn, oats, grain sorghums, barley, wheat and rye. They

also include processed feeds such as citrus or beet pulp, molasses, and hominy feed mixed or fed with protein supplements.

Corn is the most important feed grain in the United States. As a finishing feed, corn is unsurpassed. It is very palatable, easily digested, and highly fattening. Corn is rich in carbohydrates, and is a very good source of energy. However, corn is deficient in total protein and minerals, especially calcium. These deficiencies may be corrected by feeding cottonseed meal, legume hay, or other feeds containing protein and mineral matter.

Show cattle or cattle being fed to top the market are usually fed ground shelled corn along with other high quality concentrates. Corn alone or as a major portion of the ration is not a good feed for breeding cattle, nor for developing out young bulls and heifers. There is no advantage in getting breeding animals fat.

Oats are considered more of a growing feed than a finishing feed. They have more total protein than corn and are higher in fat content, but their hull accounts for about 30 percent of the grain, which lowers their feeding value. Oats are unsurpassed as a feed for breeding cattle of all ages, and tend to make young cattle grow rather than fatten.

Grain sorghums often replace corn in areas where they can be grown best. They are used extensively in the Southwest. Barley ranks between corn and oats in bulk and feeding value. Cattle feeders in Canada and in some parts of the West Coast use large amounts of rolled or coarsely ground barley.

Wheat is higher in protein, but otherwise is similar to corn in composition and nutritive value. Wheat is used very little in feed rations except for poultry scratch feed. Wheat should be cracked or rolled. Dried citrus pulp is a readily available, high-energy feed in many areas of the South. This pulp is similar to dried beet pulp and is of comparable feed value. Citrus and beet pulp compare favorably with barley in total feed value. They are high in total digestible nutrients, but low in digestible protein.

Molasses is a non-protein, high carbohydrate feed that is seldom used in good fattening rations. Its primary use is in wintering rations where the roughage is of low quality. Molasses, when added to poor quality roughage in limited amounts, increases

the consumption of the roughage. Good fattening rations usually are palatable and hence many experiments have shown no advantage in adding molasses. However, the addition of 2 to 3 pounds of molasses to the daily ration may be used to advantage when the price of molasses is considerably less than the price of corn. Molasses contains about two-thirds as much total digestive nutrients as corn and might be considered proportionately valuable in replacing up to about one-third or one-half of the grain. Blackstrap molasses is the by-product of either raw sugar manufacture or sugar refined from sugar cane. Large quantities of blackstrap molasses are available from port cities on the Gulf Coast. The liberal supply of molasses at a usually low price has stimulated its increasing use in livestock feeds. Molasses is mainly a source of easily available carbohydrates. Protein supplements should be fed with molasses as the digestible protein content is very low.

Hominy feed is a by-product of the dry corn-milling process used to produce table corn meal. This feed may be used in almost any way in which ground corn is used. Hominy feed is a mixture of corn bran, corn germ, and part of the starchy portion of the corn kernels produced in the manufacture of pearl hominy, hominy grits, or table meal. Hominy meal contains not less than 5 percent of crude fat. Because of its high carbohydrate content, its fairly high fat content, and the high digestibility of its nutrients, hominy feed contains a larger amount of total digestible nutrients than corn or other major feed grains. Large quantities of this feed are available in the South.

High Protein Concentrates

A large number of protein concentrates are suitable for cattle feeding. Quality of protein is not a critical factor in most beef cattle rations, so cattle producers should usually buy supplements on the basis of the price per pound of protein content--buying those which are cheapest. Cottonseed, soybean, and linseed meals are most often used and are readily available protein supplements for cattle. When they are fed with conventional rations, there is no appreciable difference between these meals and complex supplements. However, complex supplements or mixtures containing dehydrated alfalfa, molasses, and trace minerals have sometimes improved performance when fed with roughages of very low quality, such as cottonseed hulls or corncobs.

Animal Proteins

Proteins from animal sources, such as meat scraps, tankage, and fish meal may be used to make up part of

the protein content of rations for cattle. Fish meal of high quality is an excellent protein feed--it has about 40 percent more digestible protein than cottonseed meal.

Urea

Urea is a nitrogenous, non-protein compound. However, numerous experiments have shown that ruminants can convert the nitrogen into protein by bacterial action in the paunch. The conversion of urea into protein is efficient only when urea is added to a concentrate mixture, such as cereal grains, which supply plenty of energy for bacterial action. Urea furnishes no energy to an animal, while the common protein supplements furnish both protein and energy. Therefore, when protein-rich feeds cost but little more than farm grains, the use of urea is uneconomical.

Roughages

Roughages are always cheaper feeds than are concentrates--grains and protein supplements. Yet fattening rations cannot be made up of a high percentage of roughage, particularly harvested roughage, because most common roughages are low in digestible energy, total digestible nutrients and crude protein, and may be high in fiber content. The exceptions to this are high quality legume roughages such as alfalfa hay and high quality silage such as well-eared corn silage.

Green or succulent roughages may be important fattening rations. For instance, cattle can be successfully and economically finished on pasture with a mixture of grasses and legumes furnishing the roughage portion of the ration. In most feeding trials in fattening cattle for slaughter on pasture, the consumption of grain and protein supplement usually varies inversely with the amount and quality of forage produced by the pasture. In silage, the succulence of the roughage is preserved by storage in air-tight silos immediately after cutting.

Roughages are an essential part of fattening rations for several reasons: (1) They furnish part of the required feed nutrients at the cheapest cost. (2) They furnish bulk to the ration which is absolutely necessary in the process of rumination. The digestive system of cattle functions best when the organs are moderately distended by coarse bulky feeds. (3) High quality roughages are a good source of needed minerals and vitamins. A larger concentration of minerals and vitamins occurs in the leaves and stems of plants than in the seeds.

Legume pastures and hay may serve as a source of fairly high-energy, high-protein feed for beef cattle.

Legume forages vary widely in quality. The principal legume roughages in the South include alfalfa, clovers, cowpea hay, soybean hay, peanut hay, velvet bean hay, annual lespedeza, the vetches, and beggarweed.

Grain silages containing a high percentage of grain are good energy sources for wintering lactating cows and for finishing cattle.

Low energy and low protein roughages such as poor quality grass hay, cottonseed hulls, corncobs, peanut hulls, bagasse, and cereal straws can be used in cattle rations if they are properly supplemented.

Question No. 110 Name five feeds that are considered concentrates.

a. _____
b. _____
c. _____
d. _____
e. _____

Question No. 111 Name three feeds that are considered high protein concentrates.

a. _____
b. _____
c. _____

Question No. 112 What is urea? _____

Question No. 113 Feeding of urea is effective only under what circumstances? _____

Question No. 114 How does the ruminant animal use the urea? _____

Question No. 115 What kind of feed is molasses? _____

Question No. 116 What is the primary use of molasses as a winter ration? _____

Question No. 117 Why are fattening rations not made up of a high percentage of roughages? _____

Question No. 118 Why are roughages an essential part of fattening rations?_____

a. _____

b. _____

c. _____

Question No. 119 What is one of the main reasons for having a beef cattle operation on a farm?_____

Question No. 120 What is the chief value of National Forest range to a livestock operator?_____

Feed Additives

Feed additives are chemical compounds which are added to feed mixtures to promote growth or prevent disease. Some additives are purchased as medicated feeds which are fed for limited periods. Other additives are used as premixes or are added during mixing.

Antibiotics have an unusual role as a feed additive. They perform as a disease control, as a disease preventor and as a growth stimulant. Antibiotics are used to prevent and control such common diseases as scours in calves and shipping fever in beef cattle. The antibiotics that promote growth are produced by fermentation processes using fungi and bacteria.

Hormones have been in use since 1954. Hormones act through physiological stimulation rather than through normal nutritional channels. They improve the rate of gain and also improve the efficiency of gain. Approved hormones include synovex (testosterone, progesterone and estradiol benzoate), MGA (melengestrol acetate), Ralgro (zeranol), and Rumensin (monesin sodium).

Mineral supplements are often added to feed, fed free choice or added to salt to make up for a deficiency in the forage or feed ration being used. The minerals most commonly used are salt (sodium chloride), calcium, phosphorus and trace minerals (potassium, iodine, cobalt, manganese, iron, zinc and copper).

Beef cattle feeding is a highly varied and extremely complex business. The following general rules should be applied by anyone involved in cattle feeding:

1. In all cattle feeding programs, match the kind of cattle to the kind of feed.

2. Silage and hay are the most common forage feeds for beef cattle. Silage may be substituted for hay in the ration at the rate of 3 pounds of silage for 1 pound of hay.

3. Properly supplemented corn silage gives faster and much cheaper gains than either hay or grass silage, according to Purdue University trials of winter feeds.

4. Corn silage, properly supplemented with protein and minerals, may be used as the only roughage feed for fattening cattle.

5. Cattle can be placed on a full feed of corn silage from the beginning of the feeding period without detrimental effect.

6. Grass silage must be supplemented with sizable quantities of high energy feed such as corn or molasses to produce the same gains as corn silage.

7. Corn silage alone will not meet the protein requirements of beef cattle. A supplemental feed rich in protein is needed.

8. Sorghum silage and small grain silage have 80 to 85 percent of the feeding value of corn silage. Supplement them with grain as well as protein to get gains comparable to those from corn silage.

9. Cattle on a full feed of corn silage will consume about 6 to 7 pounds of silage per 100 pounds of live weight.

10. When cattle are on a full feed of grain they can safely consume about 2 to 2.5 pounds of grain per 100 pounds body weight per day.

11. Protein supplement, the equivalent of soybean meal, should be fed to cattle on feed at the rate of 1.5 to 2 pounds per day per head when on a full feed of grain or when the roughage is non-legume, such as corncobs, straw, corn silage and the like.

12. If cattle are to be fed on a limited grain ration with high quality roughages, such as green pasture, legume hay or legume silage, then the protein supplement may be reduced to 1 pound per head per day.

13. Beef cattle that are well fed during the winter will make less effective use of pasture the

following summer. Calves should not gain more than 1.5 pounds per head per day during the winter if maximum use of pasture is to be expected.

14. When feeding heifers, emphasize early fattening because delays associated with growth usually result in the loss of shape, and price penalties are incurred at market time.

15. Minerals can be added either in the feed or, preferably, fed free choice. A popular mineral mixture is two parts steamed bone meal mixed with one part salt. Feed loose salt free-choice next to the mineral mixture because cattle often desire plain salt.

16. An adequate supply of fresh, clean water is essential for cattle at all times.

17. Feed costs rise very rapidly as the age, size and degree of finish of the cattle increases.

18. The ability to produce cheap gains alone does not necessarily ensure profits in cattle feeding. In addition, a feeder should have wide knowledge of the cattle market. Be aware of supply and demand information throughout the country as well as seasonal and cyclical price trends.

19. Successful cattle feeders must have the ability to select the kind of feeders that will most effectively use feed available on the farm.

Question No. 121 What are the three groups of feed additives that have been proven to be effective?

a. _____
b. _____
c. _____

Question No. 122 How do hormones add value to a feed? _____

Question No. 123 How do the hormones work? _____

Question No. 124 Name four minerals that are often added to feed.

a. _____
b. _____
c. _____
d. _____

Question No. 125 What three roles do antibiotics perform as feed additives?

a. _____

b. _____

c. _____

_____

KEEPING THE BEEF CATTLE HERD HEALTHY

Diseases of Farm Animals

A disease may be defined as a disorder of mind or body marked by definite symptoms. It is an alteration in the condition of the body or any of its parts that interferes with the normal functions of the body or any of its parts.

1. Communicable or contagious. Communicable diseases are caused by germs or microscopic living organisms that can be spread by direct or indirect contact from animal to animal. Examples include blackleg, anthrax, brucellosis (Bang's disease), and leptospirosis.

2. Non-communicable or non-contagious. These are diseases usually caused by something other than germs, such as traumatisms, poisons, disturbances of metabolism, and faulty nutrition. Examples of non-communicable, non-contagious diseases are:

Traumatisms	Poisons	Metabolism disturbances	Faulty nutrition
Broken bones	Prussic acid	Milk fever	Vitamin A deficiency
Bruises	Chemical (insecticides, ammonium nitrate)	Acetonemia	Calcium deficiency
Lacerations (barbwire injuries, etc.)			

Causes of Diseases in Farm Animals

Bacteria. These microscopic organisms of various types and shapes are found everywhere in nature. Some are beneficial or non-pathogenic types such as bacteria that aid in the cheese-ripening process, the vinegar-fermenting process, the decaying of plant materials, etc. Some produce diseases and are known as pathogenic bacteria.

Pathogenic bacteria produce toxins which are poisons produced by action within animal or plant tissue. These toxins are produced by two processes: (A) Toxins produced within the bodies of pathogenic bacteria are known as endotoxins (example: tuberculosis). Such toxins are released with deadly effect when the

pathogenic bacteria die and disintegrate. (B) The most powerful type of toxin, known as exotoxin (or soluble toxin) is produced in the medium in which it grows. The powerful, virulent toxins produced in this manner enter the body and cause enterotoxemia, tetanus (lockjaw), etc.

Certain types of bacteria inflame tissues. An example is the abcess. These infections may remain localized or may enter the bloodstream and cause a serious general disturbance, and sometimes death from septecemia (blood poisoning).

Protozoa. These one-celled animals cause such diseases as anaplasmosis and coccidiosis.

Viruses. These infectious agents are too small to be retained by filters that retain bacteria, and are also too small to be seen under an ordinary high-power microscope. Among the animal diseases caused by viruses are rabies, hog cholera, and foot- and mouth-disease.

Viruses must be propagated through a host organism--media containing living cells. Many are propagated for study in growing chicken embryos.

Some of the virus diseases are complicated by the action of secondary bacterial invaders. A vicious cycle may be established by the virus and the secondary bacterial infection--the action of one increases the virulence or power of the other. This sometimes occurs in hog cholera, swine influenza, and distemper in dogs.

Mold and mold-like fungi. These non-green plants cause atheletes foot, ringworm, and some ear and eye infections in humans. Most fungus diseases are confined to the skin or fur, and are seldom fatal.

Parasitic worms. Internal parasitic diseases are caused by tapeworms, hookworms, roundworms, etc. Internal parasites are a universal hazard to livestock production. They are abundant in kinds and numbers, and losses are often unrecognized because animals often do not exhibit extreme signs of infestation.

Other causes. Foreign bodies and nutritional deficiencies are among other causes of disease. Foreign bodies, such as nails, wire, etc., are taken into the digestive tract. Ruminating animals retain many such objects in their reticulum or second compartment of their compound stomach. However, sharp objects may

still endanger the animal's life. Non-ruminating animals that swallow these objects face greater danger than ruminating animals because they have no compartment in their digestive tract that has the function of the reticulum in ruminants.

Controlling Diseases

Beef cattle have fewer diseases and parasites than other livestock. Beef cattle may be healthier because they are out in the open most of the time and get more fresh air and sunshine than most other classes of farm animals. However, serious losses may be suffered from the ravages of diseases and parasites before a farmer knows of their presence, because herds are not inspected frequently since they are seldom penned or housed.

Death losses from all causes in 1977 included more than 2 million cattle and 4 million calves. Death losses from diseases and parasites alone may have exceeded $1 billion. In addition, hidden losses are tremendous. Inspectors of the Federal Meat Inspection Service condemned about 120,000 carcasses of cattle and calves in 1954. In 1977, the number condemned was 148,900 carcasses. Most of the animals were condemned because of diseases, parasites, or septic conditions. About 330,000 parts of carcasses and 2,400,000 cattle and calf livers from approximately 13 percent of the cattle slaughtered under Federal inspection were condemned as unfit for human consumption.

Diseases and parasites must be controlled if a farmer expects to make a profit from beef cattle. Effective control programs emphasize prevention, but treatment is sometimes necessary. Cattle owners should be aware of the causes, symptoms, treatment, and prevention of the more common diseases. They should also be acquainted with the identification, life history and control of internal and external parasites. Such knowledge should help all cattle producers to prevent losses from diseases and parasites. If a major health problem does arise, contact a veterinarian immediately.

Diseases of Economic Importance

Any successful cattle producer or feedlot operator must know fully what causes brucellosis, anaplasmosis, bovine rhinotracheitis, shipping fever, and a host of other diseases. Prevention of diseases before they strike is worth many dollars of income. The use of proper precautions is limited by the farmer's knowledge of diseases and how they affect the herd. Farmers and stock producers who make a profit year after year are aware of the need to control diseases

within their herds and feedlots. Cattle diseases are prevented more easily and successfully than they are cured. Stock producers reduce losses by making it a point to understand and apply measures to prevent or reduce the incidence of disease.

Some diseases cannot be completely prevented. However, a conscientious control effort will give a larger percentage of marketable cattle and calves. Cattle diseases are so numerous and varied that large books have been written on their causes, symptoms and treatments. We will only try to cover the most important.

Question No. 126 Why is the incidence of diseases and parasites in beef cattle generally considered low compared to other livestock?_____

Question No. 127 Death losses resulting from cattle diseases and parasites alone may have exceeded $_____ in 1977.

Anthrax

This infectious disease usually runs a rapidly fatal course. Cattle, horses, sheep and goats are most commonly affected. The disease may be contracted by humans who handle infected animals or carcasses, but such infections are not common where precautionary measures are used.

Anthrax occurs in all parts of the world, but repeated outbreaks usually occur in certain areas. One of these areas is the South, and the delta and coastal areas of Mississippi have most often suffered outbreaks. The disease is considered seasonal, outbreaks usually occurring in late summer or early fall when pastures are short and flies are numerous.

Cause - The specific cause of anthrax is bacillus anthracis, a spore-forming, large, rectangular bacteria. The bacteria are highly virulent, and multiply rapidly in infected animals. When the bacteria invade the blood stream, an animal may soon die. The bacteria, under favorable conditions, develop spores of remarkable tenacity. Spores do not form in unopened carcasses, but sporulation occurs readily when the bacteria are discharged from the body of an infected animal or when the carcass is opened for autopsy or allowed to rot on the ground, etc.

Anthrax spores may remain viable for many years in the soil, in water, or on any contaminated object. Spores are usually the source of infection. Animals become infected through food, water, openings in the skin, bites of infected insects, and even by breathing the infection into their lungs. Cattle usually are infected by grazing pastures and by drinking or standing in water contaminated by spores.

Symptoms - The symptoms of anthrax vary according to the acuteness of the disease. Death is often very sudden, and the finding of a dead animal in the pasture might be the first indication of the disease. In less acute cases there may be staggering, difficult breathing, trembling, collapse, and convulsions, before death. Bloody discharges usually come from the natural body openings. Diagnosis cannot be made from any of these symptoms. Positive diagnosis can be made only from a post-mortem and laboratory examination by a veterinarian.

Control - The control of anthrax depends primarily on prevention, because once a pasture or premises become infected the infection will remain for many years. Where a premise is known to be infected, annual vaccination of all livestock early every spring and well in advance of the anthrax season is the most effective method of prevention. Subcutaneous vaccination with a spore vaccine usually provides immunity for about 1 year, and should be repeated annually. Exposed animals may be vaccinated with anthrax anti-serum which produces a rapid immunity but of a very short duration. Living-spore vaccines should be administered only by a veterinarian for safety reasons. Sometimes both shots are given simultaneously.

Infected animals seldom survive. However, the use of penicillin and other antibiotics such as Terramycin and sulfa drugs, may have some curative value if properly administered during the early stages of the disease. In all instances, call a veterinarian immediately.

Anaplasmosis

This disease, sometimes called gall sickness, occurs the world over among all breeds of cattle and some wild game, such as deer. Anaplasmosis occurs most frequently in warmer areas, especially in the South and Southwest. This disease is infectious and transmissible.

Cause - Anaplasmosis is caused by microscopic protozoan parasites, *Anaplasma marginale*, in the red blood

cells. The parasite destroys or causes the red blood cells of the infected animal to be destroyed. This disease is usually spread by blood-sucking insects such as mosquitoes, horse-flies, horn flies, ticks, and by such operations as dehorning, castrating, vaccinating, etc., through contaminated instruments. The parasites do not appear in the feces or urine of infected animals, and the disease is not spread through contact with an infected animal.

Symptoms - Symptoms vary greatly in severity and duration. In general, the symptoms in all cattle may include anemia, jaundice, and fever. The principal symptoms are sudden loss of condition, increased pulse and breathing, followed by pale mucous on membranes of the lips, nostrils, and mouth lining.

The active disease may last 2 to 4 weeks after the first symptoms appear. It may also disappear in 1 or 2 days. In rare cases, older cattle die within 24 hours. The death rate increases with the age of the animals involved. Greatest severity occurs in cattle 2 or 3 years of age or older. Between 20 to 50 percent of the cattle die. Animals that recover from the active disease are carriers and can spread the disease.

A positive diagnosis of anaplasmosis can be made by a microscopic examination of stained blood smears taken from a sick animal. Anaplasma bodies will appear in the red blood cells. The complement fixation test of the blood gives further proof of infection.

Control - Three antibiotics--oxytetracycline, tetracycline, and chlortetracycline--may be used to suppress the multiplication of the causative parasites and even rid animals of infection.

In 1965, researchers at Oklahoma State University produced a vaccine for anaplasmosis. The vaccine will not always prevent cattle from getting anaplasmosis, but it will reduce weight losses and deaths. Cattle are protected with two doses of the vaccine, which are given at least 6 weeks apart. Protection lasts for a year, but it takes at least 2 months from the time of vaccination to produce the greatest resistance to the disease.

Isolate sick animals from the herd and protect them from biting insects, sun, cold and rain. Sick animals should not be molested or moved any more than necessary and should be provided with fresh water and a succulent or green feed.

Keep the disease from spreading by sterilizing tools and equipment used to dehorn, castrate, vaccinate, etc., immediately before using them on an animal. Follow a good insect control program.

Before buying replacement animals, always require a negative blood test to screen out carrier cattle.

Question No. 128 What is the cause of anthrax?_____

Question No. 129 Is the anthrax disease common to the South?_____

Question No. 130 Can human beings get anthrax?_____

Question No. 131 How are cattle usually infected by anthrax?_____

Question No. 132 What are some of the symptoms of anthrax?_____

Question No. 133 When pastures or premises are known to be infected with anthrax, what is the only feasible method of control?_____

Clostridial Diseases

The clostridial diseases are a group of mostly fatal infections caused by bacteria belonging to the group called Clostridia. These organisms can develop protective, shell-like forms called spores, under adverse conditions. They may then remain potentially infective in soils for long periods and present a real danger to livestock. Many of the organisms in this group are also normally present in the intestines of man and animals.

A. Blackleg: Cause - Blackleg is a disease caused by Clostridium chauvoei. This is a rod-shaped, gas-producing, micro-organism which forms spores that are very resistant to destruction by heat, cold, drying, and disinfectants. The spores can live in the soil (especially in low, swampy land) of a pasture and retain their ability to germinate and produce the disease for many years. The disease primarily affects cattle under 2 years of age, and usually attacks the better calves. The organism is taken in by mouth. The animals usually acquire the disease when food, water and soil contaminated with the blackleg germs gain entrance to the body through small punctures of the mucus membrane of the digestive tract or the skin.

Symptoms - The first symptoms are high fever, lameness, loss of appetite, and rapid breathing followed by the swelling of the large muscles. In the swollen muscles a sound like the cracking of parchment paper is heard when the muscles are rubbed. This symptom may be noticed just before or after death. Death results in 18 to 36 hours after symptoms are noted. Because the symptoms of blackleg are somewhat similar to those of anthrax and malignant edema, a microscopic examination is necessary for a positive diagnosis.

Control. Large doses of penicillin and blackleg antiserum have been used to treat blackleg. However, the effectiveness of this treatment is limited by the difficulty of recognizing the disease in its earliest stages.

Blackleg can be prevented by vaccination. Blackleg bacterin gives a high degree of immunity within 10 to 12 days after vaccination and lasts for 9 to 12 months or longer. Blackleg bacterin can be given alone or used in a multipurpose vaccine that controls blackleg, malignant edema and hemorrhagic septicemia. Anti-blackleg serum can be used for immediate resistance to blackleg, but immunity produced by serum only lasts for about 2 weeks. Calves vaccinated with bacterin when over 6 months old do not generally require a second vaccination, but calves vaccinated younger than 6 months should be vaccinated again for complete protection. Burn carcasses of dead animals to prevent further contamination of the farm.

B. Malignant edema: Cause - This disease attacks cattle of any age, is usually fatal, amd arises from wound infections. The disease resembles blackleg, as it is marked by painful gangrenous swellings and severely toxic symptoms. The edema is caused by a spore-forming, rod-shaped bacterium (Clostridium septicum) which grows only in the absence of oxygen. The organism is found in the feces of most domestic animals and in large numbers in the soil where livestock populations are high. The organism enters the body in deep wounds, and can even be introduced into deep vaginal or uterine wounds in cows following difficult calving.

Symptoms - Depression, loss of appetite and a wet, doughy swelling around the wound may occur. The swelling often moves to lower portions of the body. Temperatures may rise to 106^{0} or more, with death frequently occurring in 24 to 48 hours.

Control - Treatment with massive doses of penicillin, in cases observed early, is occasionally successful. The disease can be prevented by the use of C. septicum bacterins usually produced in combination with other bacterins. Because the spores may survive indefinitely in the soil, burn the carcasses of animals that die from malignant edema or bury them deeply and apply quicklime to prevent further contamination of pasture soil.

C. Black disease: Cause - Infections caused by C. novyi in cattle occur sporadically in cow-calf operations and more are often seen under feedlot conditions. The routes of infection and transmission are not known. However, the bacteria may enter the body by a wound infection or may possibly be taken in orally. Only sudden deaths are thought to occur, and sick cattle are not generally recognized.

Symptoms - Sudden death with no apparent sick cattle. Post mortem lesions are similar to those of C. septicum (malignant edema). A wet, foul-smelling lesion is present. Diagnosis is based on the history of sudden death, significant post mortem lesions and positive laboratory confirmation on fresh tissue.

Control - No treatment is recognized because of the sudden death of the victims. C. novyi bacterins are available in combination with other clostridial bacterins. They offer greater protection with two injections given 4 to 6 weeks apart.

Question No. 134 What precautions are primary in preventing or slowing the spread of anaplasmosis?_____

Question No. 135 Is anaplasmosis prevalent in the South?_____

Question No. 136 Anaplasmosis is most troublesome during what part of the year?_____

Question No. 137 What is the cause of anaplasmosis?_____

Question No. 138 Is anaplasmosis contractable through contact with an infected animal?_____

Question No. 139 What are three general symptoms of anaplasmosis ?

a. _____

b. _____

c. _____

Question No. 140 Is anaplasmosis always fatal?_____

Question No. 141 Can anaplasmosis be prevented by vaccination? _____

Question No. 142 How may the disease be kept from spreading?
a. _____
b. _____

D. C. sordellii: Cause - This sudden-death disease mainly attacks feedlot cattle, and is infrequently seen in cows. The route of transmission is unknown, but is thought to be by mouth. No symptoms are observed as only dead animals are found.

The post mortem findings tend to occur in the areas of the brisket and throat. They consist of massive, black hemorrhage and smelly muscle necrosis, with no gas formation. No treatment is of value as sick animals are not observed.

The diagnosis is based on the findings mentioned above and by laboratory confirmation. C. sordellii bacterins are available.

E. Tetanus: Cause - This disease is caused caused by C. tetani. Although cattle are less susceptible to tetanus than most other animals, it can occur. The organism lives in the intestines of many animals and is widespread in the soil. The organism enters wounds created by punctures or lacerations caused either by accident or following "dirty surgery."

Tetanus bacteria actively invade wounds, remain in the area where introduced, and produce powerful toxins or poisons which mainly attack nerve tissue affecting both the spinal cord and brain.

Symptoms - Muscle spasms, sometimes violent, may be brought about by sudden sounds or touch. The spasms make normal movement difficult, and animals often appear incoordinated in early cases. Also, in early stages the ears are erect, the tail is stiff and elevated, and the third eyelid in the corner of the eye partly covers the eye.

In general, about 60 percent of affected, untreated cattle die. No lesions are found at post mortem, and only occasionally can the original, offending wound be found. Diagnosis, therefore, is based on typical clinical signs and perhaps the history of a recent wound.

Control - Treatment consists of tranquilization of the animal and antibiotics, preferably penicillin, to stop the organisms from producing further toxin. Tetanus antitoxin may be used in large doses, but some question its effectiveness. Supportive treatment to prevent dehydration and starvation may be needed for 1-4 weeks.

Prevention - The best approach is to make sure lots and pasture areas are free from objects that might cause puncture wounds, and by handling surgical procedures as cleanly as possible. In areas of high risk, tetanus antitoxin can be given at the time of surgery.

Question No. 143 At what age are cattle usually attacked by blackleg?

Question No. 144 What is the specific cause of blackleg?

Question No. 145 What are the first symptoms of this disease?

Question No. 146 What is the usual treatment for blackleg?

Question No. 147 Is blackleg always fatal?

Question No. 148 What is the usual preventive measure for blackleg?

Bloat

Bloat is a digestive disorder rather than a disease, but is included here because of the serious losses often resulting from bloat. Bloat is the over-distention of the rumen with gas.

Causes - The causes of bloat are not known. However, it is associated with some dysfunction of the belching mechanism. When a cow stops belching, the gas pressure builds up in the paunch, or rumen, giving a condition known as bloat. If the belching mechanism works normally, a cow can expel more gas than would usually form in the paunch under ordinary feeding conditions. Several theories may account for the cause of bloat: physical--too much dense feed, excess formation of gas, and surface tension; biochemical--

saponins and other chemical substances in high concentrations in legume forages and other feeds; and inherited characteristics--some cattle are more susceptible to bloat than others. The excessive gas pressure in the paunch may cause death from suffocation, or the pressure may stop the heart from beating. Another possible explanation is poisonous gases form in the paunch and are absorbed into the bloodstream, causing death.

Bloat is associated with grazing lush clover pastures, such as white, ladino, red, persian, and crimson clovers. White and ladino clovers are most widely used in pasture improvement programs and hence account for most of the bloat trouble.

Symptoms - The most characteristic and easily recognized symptom of bloat is a pronounced swelling of the left flank or both flanks. In severe or acute cases, the upper part of the flank rises above the level of the backbone.

Bloat varies considerably in the degree of severity or acuteness between different cattle, different seasons, and different years. Some animals in a herd seldom bloat, others may bloat regularly. In acute cases, the animal moves uneasily, breathes with difficulty, and may get down and die soon after the first symptoms appear unless relief is obtained.

Control - The best method of control is in prevention. Feeding a specially prepared penicillin-salt mixture and removing any cattle that begin to bloat has reduced the incidence of bloat by about 70 percent when cattle are grazing lush clover pastures. Provide some grazing of grass, or try to maintain about a 50-50 ration between grasses and clovers in the pasture combination.

In severe cases use a trocar and cannula or a pocket knife to puncture the paunch on the left side and let the gas escape. The penetration should be at a point equally distant from the last rib, the point of the hip, and the edge of the loin.

Poloxalene offers considerable promise as a control for legume bloat. This antifoaming agent, is a dry product which may be spread over grain as a top dressing. When fed to cattle a few minutes before they are pastured or fed freshly-cut legumes, bloat may be prevented. Poloxalene is also available in a mixture of molasses and salt, or in block form.

Brucellosis

Brucellosis, also known as Bang's disease or contagious abortion, is an infectious disease that mainly affects cattle, swine and goats. It generally causes far more serious economic losses with dairy cattle than with beef cattle because it reduces milk production. Undulant fever in humans may be contracted from handling infected animals or drinking raw milk from infected cows. No more than a few cases of undulant fever can be traced to beef cattle.

Brucellosis is of primary concern to purebred beef cattle breeders because the buyers usually require that all breeding stock be from brucellosis-free herds. The disease is also of serious concern to all beef cattle producers because their profits depend largely on the percentage of the calf crop raised annually.

Cause - Brucellosis is caused by one or more of several bacteria: Brucella abortus, B. suis, and B. melitensis. B. abortus is the most frequent cause of brucellosis in cattle. Infection takes place mainly from eating contaminated forage or other feeds and from drinking contaminated water.

Aborted calves and the vaginal discharge from infected cows that have aborted them with the infectious organisms, and are the chief source of the spread of the disease. Cows may become infected if they lick these materials and the genital organs of other cows. The disease may also be transmitted from infected animals and a contaminated environment to susceptible cattle by close association and contact. Calves and unbred heifers seldom get brucellosis. Pregnant cows are mainly responsible for keeping the disease alive.

Sexually mature bulls resist infection better than do cows, but they are subject to brucellosis. However, brucellosis is not transmitted directly from infected bulls to cows by natural service. Both bulls and cows may spread infection when they contaminate the surroundings with discharges of infectious semen and urine soon after mating.

Symptoms - Pregnant cows may abort, bear weak calves, retain afterbirths, and produce a vaginal discharge, often followed by temporary or permanent infertility.

Infected bulls may or may not show any symptoms. The enlargement of one or both testicles, loss of sexual desire, and infertility are the main symptoms in bulls.

Positive diagnosis of the disease cannot be made from symptoms alone. The only sure way to determine the presence of the disease is by blood testing individual animals.

Control - Brucellosis is incurable. An infected animal usually remains infected for life. All infected cattle should be sold for slaughter. The disease may be prevented only by employing the basic principles of sanitation and good herd management or vaccination, or any combination of them.

Vaccination with B. abortus Strain 19 (a modified culture of the causative organism) is usually done between the ages of 4 to 12 months of age.

Question No. 149 What is bloat?

Question No. 150 How do cattle usually become bloated?

Question No. 151 What are the symptoms of bloat?

Question No. 152 What is an effective prevention measure to reduce incidence of bloat?

Cancer Eye

Cancer eye is a malignant tumor on the eyeball or eyelid of cattle. This disease is most prevalent on the ranges of the West and Southwest, and is found also throughout the South.

Causes - The cause of eye cancer, like other malignant tumors, is not known. Several theories have been expressed. One opinion is that it is hereditary, particularly in the Hereford breed. Surveys in slaughtering establishments where eye cancer is most commonly found show that about 90 percent of all cattle affected are of the Hereford breed. The Angus and some other breeds appear to be wholly immune. Another opinion is that intense sunlight and irritating dust are at least indirect causes because of the prevalence of the disease on the ranges of the Southwest. Apparently the lack of pigment--color--in the eyelid and eyelashes to shield the eye from intense sunlight contributes to the incidence of the

disease. Occasionally, cattle of the breeds that have pigmented skin around the eyes develop eye cancer.

Symptoms - Lesions or ulcers which gradually grow larger appear on the eyelids or eyeballs of affected animals. Sometimes they grow and spread to the adjacent bony structures and eventually reach the bloodstream. When this happens the lymph glands of the head, the lungs, liver, and other internal organs may become involved. Diagnosis can usually be made from obvious tumors on the eyeball or eyelids.

Control - Surgery for the complete removal of the tumor in its early stage of development is the only possible treatment. Surgery would be practical only with very valuable purebred breeding stock because of the expense. Generally, the best thing to do is to sell affected animals for slaughter as soon as diagnosis is made because only the head may be condemned in the slaughter plant at that time. Animals in the advanced stage of the disease will eventually die or are likely to be condemned for human use if they are sold for slaughter before they die.

Question No. 153 What are two other names for brucellosis?

a. _____

b. _____

Question No. 154 What disease is transmitted to humans as a result of brucellosis? _____

Question No. 155 What causes brucellosis? _____

Question No. 156 How does infection usually take place? _____

Question No. 157 What is the predominant symptom of brucellosis in pregnant cows? _____

Question No. 158 What is the only positive way to diagnose brucellosis?

Question No. 159 What should be done with brucellosis-infected cattle?

Question No. 160 How may brucellosis be prevented?

Foot rot

Foot rot is an acute or chronic, contagious disease of cattle which is characterized by lameness. The disease is a serious threat to feedlot profits by reducing body weight of finishing cattle and by delaying marketing.

Cause - Foot rot (necrotic pododermatitis, foul foot) in feeder cattle is usually caused by foot injury or foot injury followed by infection.

One reported cause of foot rot is Sphaerophous necrophorous, but researchers have been unable to reproduce this organism for study. Other organisms commonly isolated from involved animals include: streptococci, staphylococci, coryne-bacterium, various fungi and other organisms, all of which are common to the feed lot.

Infection and inflammation occur when the foot or adjacent skin are punctured or cut, and come in contact with the infectious agent in the feed lot. When skin between the toes, coronary band, or soft part of the hoof is injured by stones, wire, nails, or glass, an infection often follows. Conditions about feed bunks and watering areas are often conducive to hoof injury. Exposure to manure-laden mud or water, frozen rough ground, or extreme drought may also contribute to foot infections.

Foot rot is usually a seasonal disease occurring during periods of extreme moisture, sudden freeze ups of muddy yards or severe drought.

Symptoms - The first sign of foot rot is lameness, from barely noticeable in one foot to an extensive condition where the animal will be reluctant to move. Infection detected in one animal serves as a warning of more acute pending problems. If more than one infected animal is found in a pen of calves, all of the others may also be infected as a result of hoof injuries.

Closely examine an infected hoof to see if it is inflamed up into the hock joint. Pus and other fluid may leak from the hairless skin between the toes or the coronary band. The bulbs of the heels may swell. A rotten odor often accompanies these signs. Infected cattle will usually graze, but may rest on their knees.

Acute signs of foot rot may also include elevated temperature, weight loss and, ultimately, death in some cases.

Control - Any management procedure that will eliminate hoof damage or avoid stressing hoof health will help prevent foot rot. If an animal exhibits signs of foot rot, inspect the hoof for injuries from sharp objects. Apply medication, and remove the sharp object together with the affected tissues. Move the animal to a clean, dry place and trim the hoof, if needed. Foot trimming and care may be helpful, but numerous animals may be too inconvenient to treat.

Avoid many of the problems of foot rot by thoroughly cleaning pens after cattle are removed, and liberally spread lime over the pen surface. Leave the pen vacant for at least a week following liming to help control foot rot organisms.

Maximum drainage is essential to any feedlot arrangement and will help prevent the constant contact with manure-laden mud or water.

Clean yards that are free of sharp objects such as stones or glass, or frozen, muddy, rough ground will help prevent hoof injury and infection. Thaw frozen rough ground in lots by spreading salt or fertilizer, which softens the frozen soil and may also counteract some organisms.

One of the most common preventive measures in many feedlots is the use of mounds of soil or manure. Mounds should be of large enough for cattle to stand on comfortably. The mounds should be arranged to receive maximum exposure to the sun. Occasionally spread lime on the mounds to help control foot rot.

Put concrete slabs in the lot to provide a dry area for calves. Use concrete around water fountains and feed bunks where animals frequently gather, to prevent contact with extremely wet, muddy conditions. Clean the concrete periodically.

Spread lime with 5 to 10 percent copper sulfate around watering units and feed bunks to help prevent foot rot. Consider using a walk-through foot bath containing 30-percent solution of copper sulfate, with shavings in the bottom to prevent slippage. Calves may also be walked through a box of lime and 10-percent copper sulfate to medicate or prevent foot rot. Though effective, these procedures are cumbersome and inconvenient in most feedlots.

The animals may be injected with sulfamethazine, sulfathiazole, oxytetracycline, chlortetracycline, or penicillin.

Question No. 161 What is cancer eye?

Question No. 162 In what breed of cattle is cancer eye most common?

Question No. 163 Why are Angus and some other breeds almost wholly immune to cancer eye?

Question No. 164 What is the usual symptom of this disease?

Question No. 165 What is usually done with an animal that has developed cancer eye?

Question No. 166 What is the cause of foot rot?

Question No. 167 What is the first noticeable symptom of foot rot?

Question No. 168 What is the usual cure for foot rot?

Leptospirosis

Leptospirosis is a contagious disease of animals and man caused by leptospires. These are very slender, spiral bacteria with a hook in one or both ends. The bacteria causes a wide variety of conditions in cattle, horses, pigs, sheep, goats, and dogs including fever, icterus (jaundice), hemoglobinuria (bloody urine), abortion, and death. However, during the last 15 or 20 years, our concept of leptospirosis has changed from a highly fatal disease to that of a widespread, mostly subclinical infection of many species of wild and domestic animals.

Following acute or subclinical infection, leptospires frequently localize in the kidneys. They persist there and multiply, and are shed in the urine for weeks or months after the original infection. The disease may be transmitted directly by droplets of infective urine or indirectly by means of contaminated surface waters.

Causes - More than 125 serotypes of leptospires are known; three cause disease in cattle: Leptospira pomona, L. hardjo, and L. grippotyphosa. Other leptospires isolated from cases of bovine leptospirosis include serotypes icterohaemorrhagiae, tarassovi, autumnalis, hebdomadis, canicola, ballum, poi, bataviae, butembo, and szawajizak.

The reservoir of pathogenic leptospires is the kidney of carrier-shedder animals. By urinary excretion and modern, rapid, animal transport, carrier-shedder animals transmit the disease locally, regionally and worldwide. The carrier-shedder animal may shed millions of leptospires in the urine for months without ever showing clinical signs of leptospirosis and with low (1:10) serum antibody titers. The distribution of leptospires on a ranch is directly related to the number of shedder animals, and conditions favoring their survival outside the body, i.e., small streams or ponds with alkaline pH values, and warm temperatures (68 to 80° F.). Under unusual conditions (poor sanitary practices, nutrition, or rodent control), the disease may spread to rodents and other mammals in the area, including man. Under normal husbandry conditions, the herd-to-herd spread depends almost exclusively on movement of shedder cattle or water transmission, whereas transmission for greater distances (international) occurs only by means of carrier-shedder animals.

Symptoms - The clinical picture varies widely, with calves more severely affected than adult cattle. The incubation period is 2 to 10 days. In calves and young fattening cattle, the classical case presents fever, prostration, jaundice, bloody urine, anemia, and death. The temperature rises suddenly to 104° F. to 106° F. The skin of the ears and nose may darken.

Blood in the urine may be the first sign noticed. It may diminish after 2 to 4 days, or persist until death. Jaundice may occur, along with high levels of protein in the urine. Severe anemia may follow; the number of red blood cells begins to increase after 4 or 5 days and returns to normal 7 to 10 days later. The hemolytic (destruction of red blood cells) disease may affect 50 percent of infected calves with a mortality of 5 to 15 percent.

In older cattle, signs of leptospirosis vary greatly and the diagnosis is often difficult. The signs are particularly obscure in dairy herds; lowered milk and

calf production occur with few clinical signs. In dry cows, the infection is so mild that it is usually overlooked, but in milking stock a sharp drop in milk production is noted. The milk is thick, yellow and blood-tinged, although there is no evidence of udder inflammation. Abortion is common and takes place 2 to 5 weeks after the initial infection. Abortion is most common about the seventh month of pregnancy. Numerous abortions in a beef herd are often the first indication that leptospirosis exists, the mild initial signs having passed unnoticed. Calves reared by cows that have been previously infected acquire, through the colostrum, a passive immunity which lasts 1 to 2 months. The calves generally have a higher antibody titer (or blood test) than their dams. The only positive diagnosis is by blood test.

Control - Treat leptospirosis with injections of antibiotic for three days. Penicillin, streptomycin, chlortetracycline, or oxytetracycline antibiotics are often successful, especially if administered during the early stages of the disease. Use dihydrostreptomycin, 25 mg. per kg. of body weight in one dose, to control the carrier or shedder state.

Vaccination is effective during early herd exposure; however, vaccinal immunity requires two weeks to develop and may last for only 3 to 6 months.

Hardware disease

This is actually a condition, rather than a disease.

Cause - Cattle frequently pick up, accidentally during eating, or through curiosity, nails, staples, pieces of baling wire, and other metallic objects. In many cases such objects cause no harm when swallowed, but sometimes sharp pointed objects puncture the wall of the reticulum and work forward to injure the heart or liver. The common name for this condition is hardware disease.

Symptoms - In many instances there are no visible symptoms; cattle die without any apparent cause. In some cases, noticeable symptoms may include indigestion, bloated paunch, belching, colicky pains, swelling in the brisket region, a sound of fluid movement in the heart and lung regions, and obvious pain when the animal moves about.

Control - Generally, treatment does no good. If the affected animal is extremely valuable, a veterinarian may locate the objects by fluoroscopic examination and remove them by surgery.

The best control consists of prevention by keeping metal objects away from cattle. Mineral deficiencies, especially phosphorous, may cause cattle to pick up pieces of metal, sharp pointed bones, and other foreign objects. Be sure the mineral requirements of cattle are provided in the ration, or in a simple mineral mix fed free-choice. Many cattle feeders use magnets to remove hardware from feed.

Shipping Fever

Shipping fever is a highly infectious disease. It accounts for high death losses, particularly in calves and young cattle. This complex respiratory disease is also called hemorrhagic septicemia, stockyard pneumonia, transit fever, and pasteurellosis. This disease is somewhat clinically comparable to influenza in man, and it generally follows a period of lowered resistance from stress. Some of these stress factors are: weaning, changes in environmental conditions, improper handling, excitement, exhaustion, irregular feeding and watering, branding, overcrowding, irritation of the mucous membranes of the respiratory tract, and exposure to disease organisms.

Cause - The disease is generally thought to be caused by a group of bacteria known as pasteurella; however, present thinking is that it is usually lowered resistance caused by stress that leads to a virus infection (bovine myxovirus parainfluenza 3, or bovine PI-3 virus), followed by secondary bacterial invaders.

Symptoms - Symptoms of the disease may appear within 2 to 21 days of arrival at the feedlots. The first signs of the disease are a tired appearance and reduced appetite.

Affected animals may also show signs of depression, watery or mucus-like discharge from the nose and eyes, rapid and labored breathing, considerable coughing, and sometimes diarrhea. In severe cases, cattle may die suddenly or pneumonia may develop. The disease may affect only a few animals in the lot, or as many as 70 to 80 percent.

Control - The disease can largely be prevented by eliminating the conditions which contribute to the incidence of shipping fever--overexposure, long shipments without adequate rest stops, overcrowding and improper shelters. Vaccines have become available that give some protection against the disease-triggering PI-3 virus. One widely used product is an inactivated (killed) vaccine which is given in two injections, and provides protection against the PI-3 virus and two of the major pasteurella organisms--

multocida and hemolytica. An effective treatment, if the disease does occur, is available. If given during the early stages of the disease, sulfonamides and antibiotics are highly effective in shortening the disease course. Isolate sick animals in dry, draftless quarters and treat them immediately.

Question No. 169 How is leptospirosis spread?

Question No. 170 How do animals become infected with leptospirosis?

Question No. 171 What is the effect of the leptospirosis disease on pregnant cows?

Question No. 172 What is the only method of positive diagnosis for leptospirosis?

Question No. 173 What is the cause of hardware disease?

Question No. 174 Are there always visible symptoms of hardware disease?

Question No. 175 Is treatment of affected animals usually feasible in range herds?

Question No. 176 What are two methods to control hardware disease?

a.

b.

Pneumonia

Pneumonia is an inflammation of the lungs in which the air sacs become so congested that part of the lungs may stop functioning. In all inflammations blood rushes to the inflamed parts. Some of the fluid portion of the blood may break through the walls of the lungs and fill the small air sacs. If enough of the air sacs fill up the lungs will cease to function and death results. The disease is most common in calves and young cattle, but all cattle are susceptible.

Cause - The inflammation may be caused by various agents such as viruses, bacteria, parasites, fungi,

hot or cold air, dust, and other foreign matter. The presence of foreign material in the lungs causes what is called mechanical pneumonia; this may, for example, follow treatment by drenching for some other disease. The most common causative agents are viruses or bacteria and occasionally other organisms in either single or mixed infections. Pneumonia does not occur in beef cattle as widely as in dairy cattle, presumably because beef cattle are out in the open nearly all the time.

Symptoms - The onset of infectious pneumonia is usually sudden. A rapid rise in temperature and dullness are the usual symptoms. There is a lack of appetite; also rapid and shallow respiration, and dilated nostrils. The muzzle is hot and dry, and the hair coat is usually rough. Constipation may or may not be present, but as the disease progresses, diarrhea usually occurs.

Control - Isolate infected cattle and put them in warm, dry quarters. Protection from drafts, winds and rain are essential. Provide complete rest during the disease, and for several days after its termination. Antibiotics are quite effective in many cases of pneumonia. Penicillin and streptomycin, may be used with chloramphenicol, chlortetracycline, oxytetracycline or neomycin. Treatment with antibiotics should be maintained for at least 4 days, or until the affected animal has been without fever for 24 hours.

Question No. 177 Shipping fever is particularly prevalent among what ages of cattle?_____

Question No. 178 Is shipping fever a highly infectious disease?_____

Question No. 179 Shipping fever is usually considered to be caused by what conditions?_____

Question No. 180 Shipping fever has symptoms similar to those of other major diseases. What additional symptom is sometimes shown that is characteristic of shipping fever?

Question No. 181 In what classes of beef cattle is pneumonia most common?_____

Calf Scours

Scours is most common among baby calves, but animals of all ages may be affected. This disease includes all conditions with a marked looseness of the bowels. Scours can have many causes. In all diarrheas, the intestine fails to absorb fluids, or secretion into the intestine is increased. A calf is about 70 percent water at birth. If the calf begins to lose fluids through diarrhea, it dehydrates very rapidly. This dehydration and loss of certain body chemicals (electrolytes), produces a change in body chemistry and severe depression in the calf. Even though infectious agents may be the cause of the primary damage to the intestine, death from scours is usually due to loss of electrolytes, changes in body chemistry and dehydration, rather than invasion by an infectious agent. The agent that causes scours is important, however, from the standpoint of prevention.

Causes - Scours are usually caused by bacteria in the digestive tract, where they create a toxic condition. Yet, there are several other causes including over-feeding, over-eating, irregularities in feeding, sudden changes in rations, and the type of feed. The most frequent cause of common scours in dairy calves is over-feeding milk, but this is not true with beef calves because beef cows usually don't give much milk. There are two kinds of scours: white scours and common scours. White scours is highly infectious, and usually attacks calves 1 to 3 days after birth. Common scours is a result of an upset digestive system. The various types of white scours are: reo virus scours, corona virus scours, bovine virus diarrhea, salmonella infections (there are more than 1,000 types of salmonella); bacterial scours (Escherichia coli), enterotoxemia (Clostridium perfringens), and coccidiosis.

Symptoms - Affected calves appear distressed and will not suck. Their eyes become dull and sunken, and they usually stand or lie in one place. Usually there is severe diarrhea with light-colored, foul-smelling, frequently foamy feces; and dehydration is marked. Occasionally, however, death occurs suddenly without diarrhea. The disease progresses rapidly, and the calf may be prostrated within a few hours. The course of the disease ranges from a few hours to several days, and there is high mortality in untreated cases.

Control - Treatments of calves for scours are very similar regardless of cause. Treatments should be directed toward correction of the dehydration, acidosis and electrolyte loss. Antibiotics can be given simultaneously with the treatment for dehydration.

Dehydration can be overcome with simple fluids given by mouth early in the course of the disease. If dehydration is allowed to continue, intravenous fluid treatment becomes necessary. Depending on which type of organism is causing the problem, vaccination of either the cow or the calf may be used:

Reo Virus Scours - Feed oral vaccine to calf as soon after birth as possible.

Corona Virus Scours - No vaccine available.

Bovine Virus Diarrhea - Vaccinate all replacement heifers.

Salmonella - No vaccine.

Escherichia coli - No vaccine.

Enterotoxemia - Vaccinate cows 30 to 60 days before calving.

Coccidiosis - No vaccine; Feed Amprolium as a preventive.

Good feeding practices, management, and sanitation are the control methods of choice.

Question No. 182 Why isn't pneumonia found as often in beef cattle as in dairy cattle?

Question No. 183 Are common scours a serious problem among beef cattle?

Pink Eye

Pink eye (keratitis) is an infectious inflammation of the eye. It is one of the most troublesome diseases of beef cattle of all breeds. Calves are most commonly affected, but cattle of all ages are susceptible. The disease may occur in any season of the year, but it is most common in the summer.

Causes - The exact cause of pink eye is complex and incompletely understood. Bacteria, rickettsiae, and a virus have been associated with the disease. Moraxella bovis and an unclassified virus are important infectious agents, which may act separately or together. Although the disease is infectious, irritation from intense sunlight, dust, wind, flies, grasses, weeds, and other sources make eye tissues more susceptible.

Absence of pigment around the eyelid increases

susceptibility. Some animals may become carriers after recovering from the infection. Flies may transmit the disease from animal to animal. The seasonal incidence of the disease correlates with the seasonal peak of the fly population.

Symptoms - The first symptoms are a flow of tears and a tendency to avoid light by closing the eyes. This is followed by an inflammation of the membrane lining, the eyelids, forming a congested, pink or red ring around the white part of the eye. A whitish scum eventually forms over the eyeball making it impossible for the animal to see. In severe cases, ulcers may appear on the cornea. Permanent damage to vision may occur in severe ulceration. Infected animals usually lose weight because they cannot find their way around to nurse, graze, or drink water.

Control - There are no specific immunizing agents to prevent pink eye. The treatment of infected animals on pasture may not be practial because of the time, labor, and trouble involved.

Isolate affected animals and, if possible, put them in dark stalls or shady lots. Control flies by spraying or by dipping to reduce the spread of the infection through a herd. Corticosteroid-antibiotic ophthalmic ointments are the best treatments for pink eye. Other medicines, such as 2.5 percent zinc sulfate solution, 5 percent sulfathiazole eye ointment, bacitracin ointment, or sulfa-urea powder, applied locally, may be of value. Vitamin A, in doses of one million units per animal, also may be used.

Tuberculosis

Tuberculosis is a chronic, infectious disease of man and many farm animals. However, the U.S. Department of Agriculture, cooperating with States, conducted a tuberculosis eradication campaign many years ago that was highly successful. Every state in the United States has been accredited as tuberculosis-free for 20 years or more. The disease among cattle has been almost stamped out.

Cause - Tuberculosis in cattle is caused by a rod-shaped bacterium or bacillus. The disease is spread through contaminated feed, water, and air. Cattle dung and urine are chief sources of contamination.

Symptoms - Tuberculosis may attack any part of the body, but usually the lungs and the glands of the neck and chest are most often attacked.

In many cases, no specific symptoms are evident.

There may be a gradual loss of weight and general unthriftiness; swelling of the joints, especially in older cattle; and a chronic cough and labored breathing when the lungs are infected.

Diagnosis cannot be made from evident symptoms. Positive diagnosis can be made only by the tuberculin test, which must be done by an approved veterinarian.

Control - There is no treatment for tuberculosis in cattle. All cattle that are positive reactors to the tuberculin test should be sold for slaughter, under Federal inspection, immediately. In the tuberculosis eradication program all animals that react to the tuberculin test are officially branded on the left jaw with a letter "T", quarantined, and moved only on special permit for slaughter. Prevention is the only hope for control of the disease. Breeding cattle offered for sale in nearly all markets are generally required to be tested for tuberculosis, brucellosis, and leptospirosis within 30 days previous to the sale; or to be from accredited tuberculosis-free herds.

Vibriosis

Vibriosis is an infection of the reproductive organs of mature cattle. It causes delayed breeding, infertility, and abortion. The disease seems to be transmitted primarily by carrier bulls and can be controlled by using semen from noninfected bulls on noninfected cows.

Cause - Vibriosis results from an infection of the bacterium Vibrio fetus. The organism is transmitted at the time of breeding. Most infected bulls remain carriers indefinitely. Some infected cows retain infection throughout pregnancy, remain carriers for an indefinite period during gestation, and can infect a clean bull.

Symptoms - There are few noticeable symptoms, and these cannot be relied upon for positive diagnosis. One of the indications of the presence of the disease is that many cows are not settled at the first service. They may repeatedly return for service, or the regularity of the heat periods may be seriously disturbed. A small percentage of infected cows abort during early pregnancy. Cows that abort, however, often recover quickly and conceive when bred again even though they remain as carriers of the disease.

Cultural isolation of the causal organism from the reproductive tracts of cattle and laboratory tests by a veterinarian are the only reliable methods of making a positive diagnosis of the disease.

Control - Females infected with vibriosis respond best to sexual rest (at least two heat periods without breeding), followed by treatment with antibiotics at time of breeding. Where there are no gross uterine changes, and reinfection is avoided, about 75 percent of all infected cows will recover in a short time, about 24 percent require from 2 to 12 months, and a few cows will carry the infection through a normal pregnancy and harbor the infection in the reproductive tract after calving. The best method of bringing vibriosis under control is to use artifical insemination. If no reinfection occurs, a herd may generally be regarded as free of the disease after 2 years. A vaccine for cows and heifers was developed in 1965. Annual vaccinations may be necessary to ensure immunity from the disease.

The practical approach to control is in prevention. If vibriosis is present in a herd, all breeding animals should be sold in an orderly manner as soon as possible. Then, isolate replacement heifers that are being raised and breed them to a vibriosis-free bull or by artifical insemination. Never buy breeding animals without a test being made that shows they are free of the disease.

Question No. 184 Why has tuberculosis become a rare disease among cattle and of virtually no importance?

Question No. 185 What organs of cattle does vibriosis infect?

Question No. 186 How does vibriosis affect cattle?

Question No. 187 How is vibriosis transmitted?

Question No. 188 Is it practical to attempt to treat the vibriosis disease?

Question No. 189 What is the best prevention measure for vibriosis?

Question No. 190 What are four diseases of cattle that can be transmitted to humans?

a. _____
b. _____
c. _____
d. _____

Common Parasites of Farm Animals

A parasite is an organism that lives in or on another organism, known as the host, to obtain food and shelter; there is usually some harmful results to the host. Parasites may secure nourishment from the tissues of their host, or they may take for their own use food intended for the host, while at the same time they derive shelter and warmth from the host. The parasites may cause mechanical injuries by bites, produce considerable irritation, and mechanically obstruct certain organs of their host. They may be classified into two groups; internal parasites and external parasites. These external and internal parasites cause serious monetary losses each year on farms and ranches and in feedlots. They kill some animals, and several of the external parasites transmit such diseases as anaplasmosis and pinkeye from affected to susceptible cattle. These destructive effects of parasites are well known; however, an additional major loss comes from the less obvious effects of subclinical parasitism in the form of reduced gains and poor feed utilization.

Common Internal Parasites

Three classes of internal parasites are most common in cattle.

1. Nematodes - They are round, pencil-like or thread-like organisms. Examples: stomach worms, hookworms, small hairworm and cooperids.

2. Cestodes - They are flat, white, segmented, ribbon-like organisms. Example: tapeworm.

3. Trematodes - They are flat, leaf-like organisms. Example: liver flukes.

The digestive tract of most cattle is usually inhabited by several species of parasites. They damage the lining of the stomach, intestines, and sometimes the lungs, livers and other internal organs by boring into them and living on or in them. Small hemorrhages occur and nodules form at the points of entrance. The degree of infestation varies, and the animal does not exhibit early symptoms. Parasitism may result in barely noticeable symptoms in some herds and show severe and fatal illness in other herds. Often cattle

shipped from New Mexico and other dry climates will die from worm infestation because of low resistance to the sudden invasion of worms in the South.

Stomach worms

Three species of roundworms are common in the stomachs of cattle: common stomach worm (Haemonchus contortus), medium stomach worm (Ostertagia ostertagi), and small hairworm (Trichostrongylus axei). The common stomach worm is 3/4 to 1-1/2 inches long and about the thickness of a common pin. The medium stomach worm is less than 1/2 inch long and about half the thickness of the common stomach worm. The small hairworm is less than 1/4 inch long and as thick as a hair. The life cycles of the three groups are similar. The worms lay enormous numbers of eggs, microscopic in size, which pass out with the feces. Under favorable conditions of warmth and moisture, larvae hatch from the eggs shortly after they are passed in the feces, and they become infective within about 5 days. The infective larvae are picked up by grazing animals and complete their development into adults in 2 to 4 weeks. The adults may live and produce eggs for as long as 14 months.

Symptoms - Cattle infected with stomach worms include unthrifty appearance, poor gains or loss of weight, weakness, and lack of coordination.

Control - Prevention is better than the cure. Any control measures should be set up primarily to reduce the chances that calves and yearlings will become seriously parasitized because young cattle are the most susceptible.

The control of parasites of the digestive tract requires good management and proper treatment. Moist conditions favor the development of infective larvae, and dryness kills them; hence, as a part of good management, prevent infestation by having well-drained pastures. Do not allow cattle to graze along the edges of ponds and streams. Rotation of pastures also helps prevent infestation because the larvae will be killed by environmental conditions in the absence of susceptible cattle.

Roundworms of the small intestines

Several species of roundworm are found in the small intestines. The large roundworm (Neoascaris vitulorum) is sometimes found in the small intestines of cattle. It is a very large worm, about 6 to 12 inches long, and thick as a pencil. Infection occurs when the animal swallows eggs of the parasite in feed or water that has been contaminated with the feces of infected cattle. The larvae hatch in the intestines, penetrate

the intestinal wall, and pass by way of the blood to the lungs, where they penetrate the tissues of the small air sacs and enter the air spaces. They find their way up the air passages to the throat, are swallowed, and upon reaching the intestines complete their development. A number of other species of roundworms, 1/4 to 1 inch or more in length, occur in the small intestines. The most important of these are the hookworm (Bunostomum phlebotomum) and the cooperids (Cooperia punctata, C. pectinata, and C. oncophora).

The hookworm is most abundant in areas of high rainfall and warm climate. The life cycle is similar to that of the common stomach worm. The infective larvae may be swallowed by cattle while grazing. The larvae develop to maturity in the small intestine. The adult has mouth parts that allow it to attach itself to the intestinal wall. Blood is sucked by the parasite and a anticoagulant is produced. If enough worms are present, anemia occurs and the death rate may be high unless proper treatment is given.

Three species of small worms are referred to as cooperids. They are as thick as a hair and less than 1/3 inch long. All three develop similar to the common stomach worm. The major difference is the rapidity with which the cooperids complete their development within the animal. Eggs of C. punctata are passed in the feces of infected animals 11 days after infective larvae have been swallowed. C. punctata is pathogenic. Profuse, watery diarrhea, rapid loss of flesh, and death may occur in calves heavily infested with this parasite.

A widely distributed parasite of the small intestine is the intestinal threadworm (Strongyloides papillosus). It is especially common in beef calves that are dropped in barnyards. The adult females are only about 1/8 inch long. In this worm's unusual life cycle, only the female occurs in the parasitic phase of the cycle. The eggs contain fully developed larvae at the time they are passed in the feces. The eggs hatch rapidly and may develop into infective parasitic larvae, or into free-living adult males and females. The offspring of these free-living adults may also develop into infective larvae or into another generation of free-living adults. The worm may enter the host through the skin, or the infective larvae may be swallowed.

Symptoms - Diarrhea is frequent during the first two weeks of infection and continues intermittently for as

long as 3 months. Calves may go off feed, lose condition and grow slowly, or lose weight rapidly, depending on the infection. Infected animals develop an immunity which gives almost nearly complete protection against reinfection.

Thread-necked worms also occur in the small intestines. Two species have been identified as Nematodirus spathiger and N. helvetianus. These worms are 1/2 to 1 inch long, and their head end is more slender than the other end. The eggs develop more slowly than those of other worms. The infective stage is reached within the shell in 2 to 4 weeks. When eaten with grass and other forage, the third-stage larvae begin parasitic stages. After passing through the stomachs, the larvae enter the small intestine and attach to the mucous lining. Eggs begin to appear in the feces from 21 to 26 days after the calf becomes infected. With heavy infestation, symptoms of diarrhea, loss of appetite and weakness appear about 14 days after ingestion of larvae. Apparently resistance to reinfection develops rapidly, and the adults are mostly eliminated within 2 to 3 months.

Control - Several drugs can remove worms from the digestive tract. Phenothiazine is effective against a greater range of species of worms than any other known drug. Some control may be obtained by feeding low levels of phenothiazine continuously, at the rate of 1.5 to 2 grams per day. Use a mixture of 1 part phenothiazine and 10 parts salt, fed free-choice, or a mineral mixture of 3 parts limestone, 3 parts bonemeal, 3 parts salt, and 1 part phenothiazine, fed free-choice. This treatment is more effective with calves than with mature cattle when given in the feed.

Treat all cattle in the spring and fall at the beginning and end of the pasture season. Dose each animal with phenothiazine at the rate of 20 grams (about 2/3 of an ounce) per 100 pounds of body weight to reduce parasitism. Caution: Do not give more than 60 grams per dose. The particle size must not be over 20-30 microns. Apply as a drench. This treatment is effective only against adult worms; therefore, repeat the treatment in 3 to 4 weeks to kill the worms that reach maturity during that interval.

Coccidiosis

Coccidiosis is a parasitic disease caused by microscopic protozoan organisms known as coccidia. Cattle contain 12 species of coccidia, but the hemorrhagic

and mucoid diarrhea of coccidiosis is usually caused by two, Eimeria zurnii and E. bovis. The disease is more common to cattle from 1 to 2 months to 1 year of age. However, it may develop in cattle as old as 2 years of age. The disease is usually sporadic during the wet seasons of the year, but may occur at any time.

Coccidiosis is found worldwide. The disease occurs more commonly in feedlot cattle during fall and winter months after moistening of pens and bedding from rain, snow or flooding, followed by moderate or warm temperatures. Because most species of coccidia are highly host specific, coccidiosis is not intercommunicable between species of domestic animals.

The life history of the coccidia consists of two phases. One phase begins with the discharge of the oocysts in the feces to the outside. The oocysts develop and become infective in 24 to 48 hours. They are very resistant to adverse factors in the environment and may remain infective for a long time. Exposure of oocysts to direct sunlight for 8 hours at 85° F. completely inhibits further growth. Relative humidity at 25 percent or less for 10 days prevents most sporulation, and temperatures of 50° and lower reduces the rate of development.

When the animal takes the developing oocysts into the digestive tract the second phase of the life cycle begins. In the small intestine the sporozoites from the developing oocysts are released and they penetrate into the wall of the intestine. The sporozoites develop further through several stages and cause the cells to rupture, destroying the lining of the intestinal tract. Capillaries and blood vessels are exposed and hemorrhage results. Secondary infection of the intestinal wall may result from penetration of the damaged lining by bacteria in the gut.

Symptoms - Signs usually develop after an incubation period of about 2 weeks.

The most characteristic sign is diarrhea. In mild cases the fecal discharges are thin or watery, but contain little or no blood. The most severely affected animals may develop a diarrhea which is thin, bloody fluid or thin feces containing streaks or clots of blood. The diarrhea may continue for 3 or 4 days to a week or more and the animal loses appetite and becomes depressed, loses weight, and the tail becomes soiled with manure. Severe straining may be evident. Death may occur during the acute period

or later from secondary complications such as pneumonia. If the animal survives a week or 10 days of the most severe period, it usually recovers but may be a poor gainer.

Control - Use drugs such as sulfonamides and nitrofurans. While most clinical infections are self limiting and will subside within a few days without medication, sulfa therapy, if started early, will reduce oocyst production and shorten the course of the disease.

Prevent coccidiosis by good feeding practices, good management and attention to the principles of animal sanitation.

Protect drinking water and feed against contamination with feces. Susceptible cattle should never be fed directly on the ground where feces and urine can contaminate the feed.

Roundworms of the large intestines

The two most common roundworms infecting the large intestines of cattle are the nodular worm (Oesophagostomum radiatum) and the whipworm (Trichuris ovis). The adult nodular worm is found in the cecum and colon, and the larvae or immature worms are found in nodules in the walls of the posterior part of the small intestines, cecum, and large intestines. The adult worms are about 5/8 inch long and have an anterior end bent in the shape of a walking cane. They are widely distributed in the United States, but are most common in the South, where humidity and temperatures are high. The life cycle is similar to that of the common stomach worm. Skin penetration by the larvae is possible, but infection usually occurs through the mouth. The larvae is consumed with grass or with hay cut from infested pastures. Within 24 hours after ingestion, the larvae penetrate the intestinal wall where they remain for about 10 days. They emerge into the intestinal cavity, where they attain sexual maturity, and begin laying eggs about 33 to 44 days after infestations occurred. Either moderate or heavy infestions produce illness.

Symptoms - The symptoms are loss of appetite, diarrhea within 7 to 15 days, loss of weight, severe emaciation and weakness. In response to the larvae, the intestinal wall thickens and the small blood vessels rupture. The bleeding into the intestinal cavity causes anemia, and can reduce the quantity of the red blood cells by 50 percent or more.

The whipworm is found in the cecum of livestock. This worm is whip-shaped with a thickened posterior part. The whipworm is about 2 to 3 inches long. The anterior end usually pierces the inner layers of the cecum wall with a sewing effect. Serious damage to cattle does not come from the worm's invasion of the tissues but usually from bacteria invasion following the whipworm.

Lungworms

Most internal parasites of cattle live in the stomach or intestines, but the worms (Dictyocaulus viviparus) which live in the lungs in many respects are the most injurious. These worms are 2 to 3 inches long, white, and threadlike. They live in the medium and small air passages of the lungs.

Life History - The female lays eggs, each containing a very small worm, (first-stage larva). The larva usually hatches out in the lungs. These first-stage larvae are coughed up and swallowed and then passed out in the droppings. An infected animal can pass as many as 5 million larvae in a day. This stage of the worm's life is an important threat to cattle, for 5,000 fully developed larvae can kill a young calf.

The first-stage larvae develop, but do not grow, during the time that they are on the ground. When a certain stage of development (third-stage infective larvae) is reached the small worms are able to reach the lungs when taken into the body of cattle grazing infested grass. Here they develop into mature worms and the cycle starts over.

The length of the cycle varies, depending on the weather. During warm and wet weather the larvae on the ground develop rapidly, while during cold or dry weather the development is retarded. The infective larvae can survive for weeks or months in the infective stage ready to be picked up by susceptible animals.

There are many degrees of infection, but even a lightly infected animal may be quite dangerous. The light infection may show only slight effects on the infected animal, but it might produce enough larvae to heavily infect many other animals. The only way that a lightly infected animal can be detected is by finding larvae in the droppings. This would require a microscopic examination.

Symptoms - The heavily infected animal becomes noticeably sick in a short time, usually within 2 weeks.

This heavy infection sometimes causes a form of pneumonia known as verminous pneumonia. The first noticeable symptom is a cough, and breathing is difficult. Often a loud grunt follows each breath. As the infection worsens coughing apparently becomes so difficult that it is seldom heard. A foaming, sometimes bloody material may collect around the muzzle of the animal. The animal is reluctant to move, usually has a fever, will not eat or drink, and becomes severely gaunt.

You may detect symptoms of lungworm infection, but the only way a sure diagnosis can be made is to find larvae in the manure by a microscopic examination or on post-mortem finding of the adult worms in the air passages.

Control - The use of phenothiazine treatment as given for the control of parasites of the digestive tract will aid in a control program because the phenothiazine reduces the number of larvae that become infective.

Cyancethydrazide, a white crystalline powder, removes adult lungworms from cattle. This treatment should be administered under the supervision of a veterinarian. The drug prompts the worms to move, before they die, from the lungs to the windpipe, where they are coughed up, swallowed, and later destroyed in the bowels. The worms are usually expelled within 24 hours. Treated animals improve within a few days.

Good management practices such as pasture rotation help prevent infestation, and if affected cattle are fed in a dry lot or barn, the adult worms die in a couple of months.

Liver Fluke

Liver fluke disease is caused by a flat, leaf-like worm (Fasciola hepatica), the common liver fluke. Although liver fluke infection may be caused by four species of flukes, the common liver fluke has the widest distribution. This parasite also causes more damage and loss than any of the other species. The common liver fluke is found in all the southern States. The adult fluke is about three-fourths to one and one-half inches long by one-third to one-half of an inch wide, and is grayish brown. The adult is broader at the anterior end than at the posterior. The anterior end has a cone-like projection with an oral and ventral sucker.

The parasite is hermaphroditic (possesses both sexes

in the same individual). It feeds on tissue, bile, and inflammatory exudate; it does not suck blood. The flukes usually live in the bile ducts of the host's liver and are occasionally found in the lungs. The adult flukes lay eggs in the bile which is passed into the gall bladder and from there to the intestinal tract. The eggs are carried out by the feces. The eggs that reach water or moist soil hatch in two to six weeks, depending upon temperature and moisture, into a microscopic embryo. The embryo must then penetrate the body of certain species of water snails. The snails live only in moist and marshy places. If the embryos do not find the proper snail, they die in 1 to 3 hours. When the embryos find the proper snail species they pentrate and burrow into the soft tissues, coming to rest in the liver.

The young flukes develop and multiply asexually (by simple division) within the body of the snails. The immature flukes may divide into several hundred flukes. In about 49 days the young tadpole-like flukes are released and swim about in the water. Upon striking an object, such as grass or other vegetation, they cling to the object and lose their tails. The wound from the loss of the tail secretes a sticky, protective covering that surrounds the parasite and firmly attaches it to the object. The cysted immature flukes, (Cercariae) are the infective stage for any animal that may eat the vegetation containing the cyst. The cyst can remain infective for several months. The protective covering is dissolved in the digestive tract, which liberates the young fluke.

The immature flukes burrow through the intestinal wall into the body cavity. Upon finding the liver they bore into it. As they feed and grow, the flukes destroy tissue. After about 2 months in the liver the larvae resemble small adult flukes, and they move into the bile ducts where they grow and develop into adults. The fluke completes one life cycle in about 5 to 7 months.

Symptoms - Livestock infected with flukes frequently develop symptoms associated with parasitism and are easy prey for various stomach or intestinal worms. Symptoms include weakness, diarrhea, anemia, loss of condition, and unthriftiness. Liver fluke disease produces extensive and unmeasured economic losses through reduced efficiency in feed use.

Control - Liver flukes can be controlled by eliminating the snail breeding areas and treatment of

infected cattle. Eradicate snails, which are the intermediate host, by draining ponds, ditches, puddles, and other areas where stagnant water accumulates. If drainage is not practical, use fences to keep cattle out of those areas. Snails also can be eliminated by proper use of copper sulfate.

The treatment of infected livestock will remove the adults, but does not affect the larvae. A second treatment 21 days later will usually remove the larvae as they will be mature by then.

Question No. 191 What are parasites?

Question No. 192 In addition to the damage the individual pests cause to the animal itself, name other problems they cause:

Question No. 193 How do the internal parasites work on animals and cause damage?

Question No. 194 Describe the appearance of an animal infested with internal parasites:

Question No. 195 Are calves and young cattle more susceptible to internal parasites than mature cattle?

Question No. 196 What is the danger of importing cattle into the South from dry climates such as in New Mexico?

Question No. 197 How are the internal parasites usually transmitted from an infected animal to another animal?

Question No. 198 What conditions must the internal parasite larvae have for development?

Question No. 199 What are three preventive measures against internal parasites?

a. _____
b. _____
c. _____

Question No. 200 Phenothiazine is effective against internal parasites. In what three ways may this drug be administered?

a. _____
b. _____
c. _____

Question No. 201 How are lungworms passed from an infected animal to another animal? _____

Question No. 202 Can an animal with a light infection of lungworms be dangerous? _____

Question No. 203 What is the only effective way to determine that an infection of lungworms exists in a lightly infected animal? _____

Question No. 204 What is the first noticeable symptom of infection by lungworms? _____

Question No. 205 Are lungworms as common in range cattle as they are in dairy herds or farm pasture herds? _____
Why? _____

Question No. 206 What is the most effective management for control of lungworms? _____

External Parasites External parasites are divided into two classes: Insects, which have three pairs of jointed legs, and as adults are either winged or wingless; examples are flies and lice. The other class is the arachnida, which are spider-like anthropods and having four pairs of jointed, segmented legs in the adult stage; examples are mites and ticks.

External parasites cause far more economic losses than internal parasites. Most beef cattle producers know about grubs, screwworms, lice, ticks, and various flies that annoy cattle and reduce their productive efficiency, but many are careless about controlling these pests. Simple, inexpensive and

effective control measures are available for most of these parasites.

Flies

Flies annoy cattle by crawling on their skin, biting them, and sucking their blood. Flies also transmit infectious diseases. These effects reduce the rate of gain, and result in large economic losses. The extent of these losses were not fully realized until good control measures were developed. Effective control allowed comparison of treated and untreated livestock which showed, for example, untreated cattle under heavy attacks of horn flies gained an average of 50 pounds less than treated cattle.

A. Horn Flies. This pest attacks cattle during the summer months. The flies appear in large numbers if not controlled, and their constant attack prevents the animals from feeding properly, thereby causing reduced gains in body weight.

Horn flies are about one-half the size of the common house fly and are usually found on the backs of cattle, out of reach of the animal's head or tail. During the hotter part of the day they will move to the shaded side, or underside of the animals. The horn fly is a blood sucker and the sensitive skin area around the navel and central midline may be covered with sores caused by its feeding.

Horn flies spend almost their entire lives on cattle. The female leaves the animal only long enough to lay eggs in fresh cow manure. The eggs hatch in 1 to 2 days; the larvae, or maggots develop in 3 to 5 days, and the pupal stage from 6 to 8 days. In hot weather the horn fly can complete its life cycle in 10 days. The fly overwinters in the pupal state (larval-adult transitional stage) in the northern regions, but may continue breeding throughout the year in some southern areas.

Control - Dust bags or oilers are the most popular methods in controlling horn flies on range cattle. Oilers were first in use, and can be purchased commercially or made. Commercial models have an insecticide-oil tank, with a burlap or canvas insert which acts as a wick to keep the material saturated with an insecticide.

Backrubbers may be made from cables, chain, or heavy wire suspended between two posts, and from these posts to an anchor at the ground. The cable, chain or wire is wrapped with burlap, and the burlap is treated with insecticide. Dust bags may also be hung on wire, cable, or chain and suspended between posts.

Oilers and dust bags can be used free choice or by forcing cattle to pass under the devices to obtain water, salt, or feed. Forced use ensures good fly control.

This method reduces the number of flies to 10 or less per animal throughout the fly season. If the self-treatment devices are employed free choice, the number and placement of oilers or dust bags is extremely important to ensure an opportunity for use by all animals. Older cows and bulls may dominate use where only a few are available. If some animals fail to use them, only partial fly control is achieved. It is not necessary to adjust the self-applicators to treat spring calves because few horn flies get on calves unless there are high numbers on the cows.

Put free choice oilers and dust bags near water, salt, or shaded loafing areas where cattle spend considerable time. They should be placed so they don't face the prevailing wind direction. This retards the drying action of the wind on oilers and reduces dust waste from whipping action of the dust bags. Dusts in burlap bags will cake following a rain and the cake needs to be broken up to ensure adequate dusting. Horned cattle destroy burlap bags fairly rapidly but canvas bags with nylon liners stand up pretty well under use by horned cattle.

Crotoxyphos, coumaphos, dioxathion, ronnel, lindane, malathion, methoxychlor, crufomate, and toxaphene are registered and available for use in oilers. Follow label directions for proper mixtures, and for restrictions and treatment-slaughter intervals. Crotoxyphos, coumaphos, methoxychlor, malathion and phosmet are registered and available for dust bag use. A few mixtures of two registered insecticides are also available.

Control can also be obtained through feed additives. Phenothiozine, ronnel and coumaphos are incorporated into mineral, salt or protein supplement feeds for horn fly control. These materials pass through the digestive tract of the animal and are then available in the manure to destroy fly larvae.

The success of the feed additive depends on its consumption by the animals. Salty vegetation in some areas, calves in the cow-calf herd, and variability of intake among mature animals in a herd generally results in erratic fly control. In general, the feed additives work well on steer or heifer herds and not as well on cow-calf herds.

B. Face Flies. The face fly (Musca autumnalis De Geer) was first reported in the United States in 1952. It has spread all the way across the northern half of the country and southern Canada since, and has now extended its range south into Alabama.

The face fly is generally a pest along waterways or in areas of higher rainfall. However, irrigated pastures in the more arid regions and pastures with tree cover will also support large numbers of face flies. Apparently the manure in which the flies breed dries out too rapidly for the fly to complete its larval development in the arid, open ranges.

Losses to the livestock industry caused by the face fly is estimated at $68 million annually. The losses from this pest are more difficult to document than for the horn fly. However, the fly has been implicated in the transmission of pinkeye, which thus makes it a serious pest.

Adult face flies closely resemble house flies except they are slightly larger and darker. The persistence and habit of congregating about the eyes and nose of animals helps to distinguish the face fly from the house fly. The larger size (double) helps distinguish the face fly from the horn fly. Most of the face flies on cattle are females. The flies spend considerable time away from cattle, which makes control of this pest more difficult than for control of horn flies, which spend most of their time on cattle. The face fly, like the horn fly, deposits its eggs in fresh cow manure. The eggs hatch in 1 to 2 days; the larval stage lasts from 3 to 6 days, and the pupal stage (transitional larvae-adult) last 7 to 10 days. Unlike the horn fly, which overwinters in the pupal form in the pasture, the face fly overwinters as an adult in barns, houses, other farm buildings, and probably in trees, cracks and crevices and wild animal shelters in pasture areas. It thus can be a pest of humans around dwellings when it is migrating into the overwintering site in the fall and out again in the spring.

The face fly is not a blood sucker; its mouthparts are the sponging type like those of the house fly. The face fly feeds on various animal secretions. Tears, saliva, nasal mucus, blood and serum exuding from wounds, perspiration and filth adhering to the animal's hair all attract the face fly. The persistence and habit of the fly in congregating about the eyes and nose of an animal cause the cattle to bunch and seek shade or water. These evasive

actions by the cattle undoubtedly interfere with normal grazing patterns and thus reduce milk production and weight gain.

Control - Adequate face fly control is very difficult to obtain. The face fly spends some of its time on the face of cattle which means that the animal's face must be treated with insecticide. Unlike horn flies, face flies are at least equally attracted to calves as to cows, which means the calves also have to be treated to ensure adequate control. Because of these factors, get insecticide on the faces of cows and calves by some method two or three times weekly. The use of dust bags and oilers is one recommended method.

Dust bags and oilers are used most often as a free choice system for horn fly control. Free choice is not generally adequate for face fly control. Forced use of the system is almost mandatory to control face flies. Water, feed or salt should be fenced and dust bags or oilers hung in gates to force cattle to use them daily. The bags or oilers must be lowered to the point that cows contact them with their faces while entering and so that calves also use them. You may need to lower them gradually after the cattle get used to them. It is generally easier to get cattle accustomed to oilers or dust bags if they can see under them at the start.

Crotoxyphos, coumaphos, malathion, methyoxycholor and phosmet are registered as dusts for dust bag use. Crotoxyphos, coumaphos, dioxathion, ronnel, lindane, malathion, methoxycholor, crufomate and toxaphene are registered for use in oilers. Read, understand and follow label directions for use, mixtures, use restrictions and treatment-slaughter intervals for all insecticides.

Treatments by power sprayers or dusters are also effective, but you must treat at 2- or 3-day intervals for face fly control. Feed additives can be used and are fairly effective when cattle are not grazing on salty vegetation, as the additives are incorporated into salt, minerals or supplements fed to livestock.

C. Horse Flies. The horse fly family, Tabanidae, contains many species which are serious pests of beef cattle. These insects may not be much larger than the house fly, but some species are an inch or more long. Egg masses of most species are deposited on vegetation, rocks or debris projecting from the water or near the water's edge, although

several kinds breed in fairly dry areas. While the males feed on plants, the females use their piercing mouth parts to penetrate the skin and feed on blood from cattle, horses and other domestic animals.

Question No. 207 What are the two general classes of external parasites?

a. _____

b. _____

_____

Horse flies and deer flies usually occur spasmodically. There may be high populations for only a few weeks, but they are generally present during the summer months in sufficient numbers to be very annoying to beef cattle.

They are vicious biters. They cut a small slit in the hide of cattle with their lancelike mouth parts and suck the blood. Often the blood oozes out of the bites after the fly is through feeding. These flies spread anaplasomosis and anthrax, and are suspected of spreading leptospirosis.

Livestock production losses result principally from annoyance and loss of blood. The bite causes pain and anxiety, and a few horse flies of the larger species can keep a herd from feeding normally.

Control - Horse flies are perhaps the most difficult to control of all the blood sucking flies. The majority of the chlorinated-hydrocarbon insecticides will kill horse flies even at low dosages, but they will not do so fast enough to prevent biting.

The synergized pyrethrins give the best results. Protection is short-lived, lasting no longer than 3 days. The treatment must be repeated often.

D. Stable Flies. The stable fly (Stomoxys calcitrans) resembles the house fly in size and general appearance, but has a needle-shaped mouth part that at rest protrudes in front of the fly's face. They are vicious, blood sucking insects that attack the legs and lower body parts. The bites are very painful and usually cause cattle to seek refuge in a pond, deep shade, or by crowding together. This reduces the time spent feeding by livestock and reduces the weight gains. Stable flies move to the side of a building, fence posts or vegetation to digest the newly drawn blood.

Stable flies lay their eggs on moist, decaying organic matter, such as straw, grain, hay and manure, where

they hatch in 1 to 3 days, producing a very small white maggot or larva. The larva will develop to maturity and pupate in 9 to 30 days, depending on moisture, warmth, and food. The pupa will mature in another 6 to 20 days. Flies will mate when only 2 to 3 days old, and they begin depositing eggs at 5 days of age. The life cycle may be completed in about 3 weeks under good conditions, and the females live from 4 to 6 weeks.

Control - Eliminate natural breeding areas as the primary means of prevention. Spread manure frequently and remove of all fermenting or decaying organic material such as straw, spilled feed, and silage. Spray insecticides on barns, corral fences, trunks of trees, or other places where the flies like to rest.

Spray applications on livestock are inefficient because stable flies alight on cattle only for short periods. The synergized pyrethrin prevents stable flies from feeding and kills many of the flies that come to feed. A spray of the type recommended against horse flies will protect cattle for several days.

E. House Flies. The common house fly (Musca domestica) occurs wherever livestock are raised, and is perhaps the most abundant insect pest of feedlots. Because house flies do not bite livestock cattle producers tend to believe that it is less important than biting flies. However, the house fly spreads filth and disease organisms and it causes extreme annoyance to cattle. Thus, the house fly causes serious economic losses. The house fly lays its eggs in manure, garbage, and decaying vegetable matter on farms and in cities; it is a product of filth and poor sanitation. The eggs hatch in 12 to 36 hours. The larvae mature and pupate in 4 to 10 days. The pupae mature and adults emerge in 3 to 6 days. The newly emerged adults are sexually mature in 1 to 2 days. Female flies may deposit as many as 2,500 eggs during their life span of 2 to 4 weeks.

Control - The control of house flies is difficult because these pests lay eggs in so many places. Good sanitation, with prompt disposal or storage of manure is essential. Spraying of insecticide or dusting inside barns, animal sheds and favored outdoor resting places is a necessary part of treatment. Residual treatment may be with sprays, dusts or poison baits. The baits may be granular or liquids, but all consist of an organic phosphorus insecticide and a feed that attracts the flies.

F. Heel Flies. Cattle grubs, which are the larval stage of the heel fly, seldom cause death, but cause farmers to suffer tremendous economic losses because of slow growth rate of young animals, and the damage they do to the meat and hides of infested cattle. While in the back, grubs injure the loin muscle and thus cause considerable trim loss and downgrading of carcasses. Also, grub holes damage the thickest and most valuable part of the hide, and greatly decrease its value. Years ago, most cattle raisers ignored grubs, but modern livestock producers know that grubs must be controlled to protect their investment in cattle and feed. An accurate estimate of the economic losses caused by cattle grubs is hard to make because of the great variation in injury from place to place and year to year. Obviously, the greatest losses occur in regions where there are large numbers of both species of cattle grubs, and these losses are most apparent in young cattle that are slaughtered while grubs are in the back. At current livestock prices, losses of $5 to $10 per head would not be unusual. Of even more practical importance to the cattle raiser is the fact that many packing houses and feedlot operators will not buy yearling cattle without a certificate from the producer that the animals have been treated and are grub-free. Nationally, cattle grubs cost livestock producers an estimated $192 million per year.

Cattle grubs are the immature forms of two species of warble flies usually known as heel flies. Cattle producers are most apt to be aware of these parasites at two points in their life cycle--first, when heel flies are chasing cattle in the spring and early summer, and again the following winter when grubs appear in the cow's back after 9 or more months inside the body.

Cattle that are gadding (running from heel flies) do not graze properly, often injure themselves running through fences, etc., and become unmanageable; as a result milk production and growth are reduced. Ranchers are often forced to postpone important operations such as moving cattle to mountain pastures until the end of the heel fly season.

Heel flies are closely related to other flies, but they look more like small bumblebees--hairy, black, and striped with yellow. The heel fly is nearly three times larger than the house fly. Evidences of cattle grub infestation are warbles or grubs which appear beneath the skin on the backs of cattle, usually during November, December and January.

The adult heel flies lay their eggs and attach them to the hair about the heels and legs of cattle during the spring or early summer. During the egg laying season cows may be observed running wildly across the pasture with their tails in the air, trying to avoid heel flies. After the eggs are attached to the hair they hatch in a few days and the young grubs burrow into the skin. The grubs soon begin to work their way upward through the muscles and into the body cavities of the animal. They eventually reach a position just beneath the skin along the back and make a breathing hole through the skin of the animal. The larvae mature in about 6 weeks after reaching the back of the animal and emerge through the breathing hole in the skin and fall to the ground. The larvae go into the pupa stage in the ground and remain in this form for a month or so. The adult heel flies emerge from the pupa stage and mate shortly afterward. Egg laying may begin on the same day that the adults emerge and the life cycle begins again.

Control - The most practical control measure for cattle grubs is a systemic insecticide. Coumaphos, crufomate, famphur, fenthion, phosmet, and trichlorfon have all been successfully and extensively used for grub control by the pour-on technique. Some of these materials can also be used to spray or dip cattle. Also, commercial mineral mixes and feed additives that contain a systemic insecticide are available if the livestock owner prefers to use this method. Oral-capsule, oral-drench and intramuscular injections can be used also. Because the exact formulations often change, obtain specific recommendations for the use of these systemic insecticides each year from your county agent, veterinarian, State university, or the manufacturer of the product.

Do not use systemic insecticides for grub control on sick animals or animals under stress. In addition, no systemic insecticide should be applied at the same time cattle are drenched, given other internal medication, or treated with synthetic pyrethrins, their synergists or with other organophosphorus pesticides.

Before purchasing any systemic insecticide, check on the cut-off date for its use in your area. Cattle that are heavily infested with large, first-stage grubs at the time of treatment can be injured or even killed by the reaction of their bodies to the grubs killed by the insecticide. The reaction to dead, northern cattle grubs is apt to be paralysis of the hindquarters. Undesirable side effects can be avoided by treating cattle before the cut-off date

and, preferably, as soon after the end of heel fly season as possible.

Cattle should be observed for toxic side reactions for 48 hours after treatment with a systemic insecticide. Common side reactions include stiffening of the hindquarters, bloat, and excessive salivation. If these symptoms persist, consult a veterinarian.

In various parts of the world, mostly in Europe, eradication campaigns against cattle grubs have been organized, legal stipulations have been laid down, and government agencies examine and treat all of the cattle in a designated area. After 2 to 3 years of operation, such programs usually result in the elimination of 99 percent or more of the grubs. However, so far, true eradication has not been achieved in any large land mass such as an entire country.

G. Screwworms. The screwworm fly is found in the Western Hemisphere and is a persistent pest of domestic livestock and large, wild animals in Mexico and Central and South America. The southern United States may also be invaded by screwworm flies in the summer. Because of these flies' ability to disperse and the opportunity for the transportation of immature and adult screwworms by man, constant vigilance is required to limit the spread of this pest. Livestock losses attributed to screwworm infestations have amounted to millions of dollars annually. In addition, losses can be measured in the death of wildlife that further depress economic opportunities because of losses in recreational and game lease revenues.

The screwworm fly belongs to a group of insects commonly referred to as blow flies. Infestation of cattle, sheep, goats, hogs, deer and antelope are common. The screwworm has four developmental stages: egg, larva or maggot, pupa and adult fly. The screwworm fly is about twice the size of the common housefly and is bluish-green with three prominant longitudinal stripes on its back. The female fly lives 2 to 4 weeks and produces several thousand eggs that are usually deposited in masses of 200 to 400. Eggs deposited on the margins of wounds hatch into maggots within 12 to 24 hours. The screwworm maggot is characterized by a tapered head possessing rasping and tearing mouth parts. The maggot feeds only in living flesh. Feeding damage results in a bloody, foul-smelling discharge from the wound that often attracts additional screwworm flies. After feeding

approximately 7 days, the maggot drops from the wound and burrows into the soil. The transitional pupa stage develops in the soil within 7 to 10 days during warm weather. Flies feed on liquids associated with manure, wounds and various plants during the first few days of adult activity. Females mate only once, and usually seek a mate when they are about 2 days old. The male, however, will mate with several females. The entire life cycle from egg to adult requires about 21 days.

Screwworm Eradication - In 1962, the U.S. Department of Agriculture established a laboratory at Mission, Texas designed to mass produce sterilized screwworm flies. Maggots are produced in large vats and allowed to develop to the pupal stage which are collected and sterilized by exposure to atomic radiation. Several hundred million sterile flies are produced weekly by the Mission Laboratory. Because the native female mates only once it is possible to produce self-annihilation by overwhelming a native male population with a mass release of equally aggressive sterile males. The sterile male technique has worked well when sterile flies are distributed carefully and in numbers capable of dominating the native male population.

Livestock Management - Animal management is important in the prevention, detection and control of screwworms. Unnoticed, infested wounds can produce hundreds of flies capable of causing an outbreak. During months of screwworm activity the following steps will greatly reduce the incidence of screwworm cases: Keep livestock handling equipment in good repair. Remove protruding nails, broken boards, barbed wire and other obstacles that increase the opportunities for livestock injuries. Unnecessary cuts and scratches can be reduced with regular preventative equipment maintenance.

Inspect animals twice weekly to detect new wounds and to determine if screwworm infestations are present.

Postpone dehorning, castration, docking and other similar activities until the winter months when screwworm fly activity is improbable. If surgical operations must be performed, use a wound protectant.

Control - A variety of insecticides formulated as smears, dusts, liquids and pressurized aerosols are available from livestock and veterinary supply outlets. Coumaphos, ronnel, lindane and toxaphene are the primary insecticides effective in screwworm

control and prevention. Strict adherence to pesticide container label directions will ensure their safe and effective use.

Question No. 208 When is the horn fly particularly prevalent among cattle?

Question No. 209 If horn flies rarely, if ever, kill an animal, how do they affect the animal and cause a loss to the cattle producer?

Question No. 210 What size are the horn flies?

Question No. 211 An insectide spray is probably the most effective way to treat horn flies and numerous other cattle pests, but what is another effective method that is very simple to use?

Question No. 212 How may the self treating devices be set up and used?

Question No. 213 What are cattle grubs?

Question No. 214 What is the most usual evidence of cattle grub infestation, and when do these pests usually appear?

Question No. 215 Several drugs are effective against the cattle grubs--what are five different methods of application?

a.
b.
c.
d.
e.

Question No. 216 What are screwworms?

Question No. 217 An intensive eradication program has been conducted in the South since 1962. This program has proven remarkably successful and has virtually removed this

fly as a serious pest of cattle. What stage in the life history of a screwworm fly does this control program concentrate on?_____

_____

_____

_____

_____

_____

_____

Mosquitoes

Mosquitoes are scourges of both mankind and livestock. About 145 species exist in the United States. Some are local and do not cause a great economic loss. Others are widespread and cause extensive losses. Mosquitoes of the genera Aedes and Psorophora may attack livestock in such numbers that death or serious production losses occur. They irritate livestock, cause them to mill around, run wildly, stamp, and bunch together on high ground. These frantic actions and the loss of blood from bites cause weight losses and reduce milk production in cows with suckling calves. Mosquitoes also transmit several livestock diseases, including anaplasmosis.

Some of the Aedes species reproduce in such vast numbers in marshes, swamps, overflows, and tidal flats that they can cause death by suffocation. The masses of mosquitoes prevent breathing by clogging their victim's nostrils. Dense smoke acts as a repellent and smudges are often used to give the livestock some relief.

Control - In some areas it is almost impossible for cattle producers to protect their livestock from attack. In other areas they can control the mosquitoes by treating the larval stage. They may fill or drain breeding places or apply chemicals to larval growing sites or areas infested by adults. Mosquitoes often fly over large areas, and as a result community action is often needed to eliminate breeding areas and apply insecticides effectively. In some cases where control or treatment is not possible, repellants may be the only solution. Unfortunately, residual sprays on the animals do not prevent attack, and repellants that will give adequate protection during heavy outbreaks are not available. Synergized pyrethrins, as recommended against horse flies and stable flies, will give temporary relief by frequent respraying. Airplanes are used in some places to control large areas infested by adult mosquitoes and flies. Ultra-low-volume pesticides, in some cases, give exceptional insect control with more than 75 droplets per square inch.

Lice

Cattle lice are small, but they reduce financial returns of nearly every cattle enterprise. Even moderate louse numbers can retard growth of calves and feeders and require more feed per pound of gain. Lice-infested cows produce less milk for their calves. Cattle damage fences and bruise or scrape themselves as they rub to relieve the itching caused by millions of lice can on their bodies. Severe blood loss from sucking lice can cause anemia. Lice-induced anemia causes calf abortion and may even result in death of the infested animal. Calves, yearlings, and old under-nourished cattle suffer most from lice infestations.

The five species of cattle lice found in North America include four which feed by sucking blood. These are the shortnosed cattle louse, longnosed cattle louse, little blue cattle louse, and the cattle tail louse. The fifth species, the cattle biting louse, feeds on skin tissue of cattle and does not suck blood.

All cattle lice spend their entire lives as parasites on living cattle. When removed from cattle they live a few days at most. The females lay eggs which they glue to individual hairs close to the skin of their host. Immature lice are called nymphs. Each nymph sheds its outer skin three times as it grows to adulthood. Nymphs resemble adults of the same species, in feeding habits and appearance.

A. Shortnosed Cattle Louse. Although the shortnosed cattle louse (Haematopinus eurysternus) is seldom a problem of young calves, it causes damage to adult beef cattle.

Adult, shortnosed cattle lice are slightly over 1/8 of an inch long and gray-brown. The eggs are hard and bone-white to brown. They hatch in 9 to 19 days, usually 12 or 13. The nymphs become adults within the next 12 days. Females begin laying eggs after about 4 days of adulthood. Thus, this species completes a life cycle in about 28 days, although the time may range from 3 to 6 weeks. About one out of five lice in this species is a male. Males live about 10 days. Females live 15 to 16 days, producing one or two eggs per day.

B. Longnosed Cattle Louse. This species louse (Linognathus vituli), unlike the shortnosed cattle louse, infests calves most heavily. It is often found on mature cattle, but seldom in great numbers.

Adults are nearly one-tenth of an inch long. They appear quite slender, being about one-third as wide as they are long. Their head or "nose" is noticeably pointed. Longnosed cattle lice are bluish-black. Their eggs, dark blue and soft shelled, require from 8 to 14 days to hatch. The egg-to-egg life cycle requires 21 to 30 days, usually about 25. Females lay about one egg per day.

C. Little Blue Cattle Louse. This species (Solenopotes capillatus), resembles a small longnosed louse. It is similar in color, but is slightly less than one-sixteenth of an inch long when full grown. The head is bluntly rounded. The eggs are similar to those of the longnosed cattle louse, but smaller. Also, a cow hair on which an egg of this species is laid is characteristically bent at an angle where the egg is attached. Incubation requires from 9 to 13 days. Nymphs mature rapidly, and females begin laying eggs about 11 days after hatching. Few details of the biology of this species are known.

Little blue cattle lice are more common than all other cattle lice in the Delta States, the Southeast, in Oklahoma and perhaps in East Texas.

D. Cattle Biting Louse. Although this species (Bovicola bovis) does not suck blood, it's feeding and movement on the skin of cattle cause itching and distress. Cattle biting lice are present on most beef cattle.

The cattle biting louse is easily distinguished from sucking lice. It is about one-sixteenth of an inch in length. The head is large, nearly round, and two-thirds as wide as the body. The head and throat of both adults and nymphs are brownish-amber. Nymphs have pale cream-colored abdomens. The adult abdomen is darkly outlined and has a series of brown crossbars on a pale background. The eggs are pearly white when freshly laid and become pale brown as the embryos develop within.

Cattle biting louse eggs require from 6 to 11, usually 7 or 8, days to hatch. Nymphs reach adulthood in 12 to 21 days. Females begin producing eggs 3 days after becoming adults. A complete life cycle can occur in as little as 3 weeks, but may require a month or more. Populations of this species are usually from 95 to 99 percent female. Reproduction is accomplished by parthenogenesis, a form of reproduction without mating.

Females commonly lay 30 to 35 eggs during a 4- to 6-week period. Adults survive as long as 9 or 10 weeks.

E. Cattle Tail Louse. Little information is available on the biology of the cattle tail louse (Haematopinus quadriper). It is closely related to the shortnosed cattle louse and probably has similar rates of reproduction and growth. Cattle tail lice prefer to live on the long-haired portion of the tail, but are also often found on the neck and around the eyes.

Unlike other cattle louse species, tail lice are most abundant in late summer and early fall and are scarce throughout the winter. This is often the most damaging species in coastal areas of the South including southeastern Texas, but it is absent or uncommon in the Great Plains States.

Lousiness is primarily a wintertime problem on cattle that are pastured in the open. Direct sunshine, rain and self grooming by cattle keep louse numbers low in the thin, summer hair coat. One of the first signs that cattle are lousy is that they rub and scratch themselves against fences, feed bunks, trees or other objects. About 1 to 2 percent of the herd may be carriers or carry extremely high numbers of lice even in the summer. Bulls are carriers in a disproportionately high number of instances. This may be because bulls are housed more often than cows, because their hair is longer and more dense, and because the bull's massive neck and shoulders prevent him from grooming himself as effectively as do females and steers. Cattle sucking lice sometimes gather in dense patches visible several feet away. Close inspection of these patches will reveal individual lice, both adults and nymphs, as well as eggs. Sucking lice spend most of the time with their heads partly buried in the host's skin as they engorge themselves with blood.

Cattle biting lice are generally less concentrated into discrete groups. In heavy infestations, skin areas may become very densely populated by these small brownish-amber lice.

Two or more species of cattle lice often occupy the same animal. Usually an animal with many sucking lice only has a low or moderate number of biting lice.

The shortnosed sucking louse may cause anemia in cattle. The cattle appear weak and have extremely pale skin around the eyes, muzzle, and udder. Their

red blood cells may be reduced to as little as one-half or one-fourth the normal number.

Control - The primary way in which lice are spread is from animal to animal when cattle are in close contact with one another, such as during feeding, breeding, or shipping. Some lice and louse eggs drop into bedding or are rubbed off, along with hair, onto fences and feed bunks. These die in a few hours in cold weather; but in warm weather the lice may live for several days if not exposed to direct sunlight, and some of the eggs may hatch. Other cattle may become infested from contaminated bedding, bunks, sheds, or trucks. Good sanitation of these areas are to either let them stand empty for 10 days, or disinfect them before bringing in clean livestock. Several insecticides are available.

Herds routinely treated against cattle grubs, ticks, horn flies, or face flies, may not have enough lice to warrant treatment. When cattle are to be treated for lice you must consider what other insecticides or medications have been, are being, or will be used on the same animals. Multiple treatments or combined effects of different treatments may cause toxic reactions in livestock. This risk is especially true of the organo-phosphates with systemic action, which are popular in grub control programs. If grubby cattle are to be treated for lice or other pests, it is wise to do one of the following: 1) treat early in the fall, with timing and insecticide selected to kill the cattle grubs also, or 2) if the safe date has passed for using systemic insecticides against grubs, use only a nonsystemic insecticide against the lice. Sprays are considered the best treatment for lice. Others that give good results are dipping, dusting and rubbing devices.

Question No. 218 What are the two general types of lice, and which is the most damaging to the animals?

a. _____
b. _____
c. _____

Question No. 219 Drescribe the appearance of animals infested with lice: _____

_____
_____
_____
_____
_____
_____

Question No. 220 What types of animals suffer most from lice infestation? _____

Question No. 221 Numerous insecticides are effective in controlling cattle lice. Name three ways in which they may be applied:

a. _____
b. _____
c. _____

Question No. 222 What is usually considered the best control method for lice? _____

Mites

Mites - These pests cause scabies and mange, terms which are often used interchangeably, but are defined as follows:

Mange is any skin condition of man or animals associated with a mite. Scabies is a particularly serious, debilitating, reportable mange condition. The causative organisms, mites, are minute arachnids related to the ticks and spiders. Although most of the thousands of existing species of mites are free-living, a small number, including those that cause scabies, are parasitic.

Some mites on cattle transmit diseases that place their hosts in legally restrictive categories. Three varieties of mite infestation are grouped together under the term scabies: (1) psoroptic, or common scabies, (2) sarcoptic scabies, and (3) chorioptic scabies.

As a rule, when scabies mites are detected, the infested cattle are required by law to be quarantined and treated. Other mites on cattle are said to cause mange; animals so infested may be handled and transported without governmental agency concern.

The annual cost of scabies to the cattle industry and to the nation is a controversial matter. In fiscal 1973, for example, an outbreak of cattle scabies involved 53 ranches and feedlots, all in the Southwest. During that outbreak, nearly 40 million inspections of individual cattle were conducted nationally, and

some 2.7 million head of cattle were dipped, either once or twice. Inspectors' salaries and travel costs amounted to $3.5 million for the year. Adding all direct costs and intangible losses associated with this enormous operation, USDA economists estimate that $40 million was spent on, or lost as a result of, cattle scabies. Even for the multibillion dollar cattle industry, this is a substantial economic drain.

A. Mange Mites. The cattle itch mite (Psoroptes bos), was first isolated in New Mexico in 1963, and reported only a few dozen times since, mostly from the Southwest. The skin condition with which it is associated is of minor importance; the disease appears to be self-limiting and exists for perhaps no more than 2 years even on once heavily-infested animals. Because so little is known about this parasite on cattle and because it appears to be easily controlled, the USDA presently requires that all herds of cattle in which it is detected be quarantined and treated.

Demodex bovis, the hair follicle mite, is found everywhere in the world. One or more species of this mite are known to infest most species of mammals, including man. The cigar-shaped, worm-like parasites live in the hair follicles or sebacious glands within the skin and are commonly visible on dairy cattle, but not on beef cattle. The injury they inflict, confined to the skin, is of concern mainly to the hide and leather industry.

B. Scabies Mites. (Psoroptes ovis) - Scabies has come to mean psoroptic scab, common scabies, or its equivalent to most cattle producers during the past half century. Common scabies is caused by P. ovis, a parasite that spreads quickly and easily among cattle of all ages, classes, and condition.

Some external parasites, like many kinds of lice, are host specific; that is, they parasitize only a single species of host and cannot survive on any other. P. ovis is host specific to a degree; it lives only on sheep (which it prefers to other animals), on cattle, on horses, and on the American bighorn. These mites may transfer from one of these species of host to another--as from sheep to cattle--but are quite unlikely to do so in nature. When they do, they rarely survive to produce disease on the second host.

The common scabies mite may attack any part of the body thickly covered with hair. The first lesions usually occur on the withers, along the back, or around the root of the tail. Infestations cause loss

of weight and failure of young stock to thrive and gain normally, and they may kill calves or range cattle exposed to inclement weather. The mite is pearly white, barely visible to the naked eye, and about 0.6 mm (1/40 of an inch) long when an adult. All stages have four pairs of legs except the larval, which has only three pairs. Each female in her lifetime deposits perhaps 15 to 30 eggs that hatch after an incubation period of less than 1 week. The young mites feed, moult, reach maturity, and mate, and the females deposit eggs in from 10 to 12 days. The entire life cycle, from egg to egg, is spent on the host.

Psoroptic scabies is by far the most injurious form of cattle scabies and requires immediate quarantine and control measures. In fiscal 1973, 51 cases in eight States, mostly in the Southwest, were detected.

All of the scabies mites are one-host parasites: They live, mate, deposit eggs, and die on the same host. Some, however, drop off or are rubbed off the skin and haircoat of the infested host, and establish themselves on a new host. In this elementary way, all of the forms of scabies become highly contagious diseases, and extreme care must be taken to prevent their spread. Cattle scabies may be borne from farm to farm on newly purchased stock and on infested cars, trucks, and enclosures.

Sarcoptic scab (Sarcoptes scabiei) - Another form of scabies is caused by the sarcoptic scab mite, S. scabiei. This parasite is not specific to barnyard animals only where it is commonly seen on swine, but may be found on household pets, wild carnivores, monkeys and man. Truly a cosmopolitan parasite of mammals, it is almost as universal as the demodectic mite mentioned earlier. Oddly enough, it has never been isolated from sheep in the United States. Sarcoptic mites may move from one species of host to another, as from cattle or swine to humans, but some scientists believe the secondary infestations are only temporary.

In establishing themselves on cattle, sarcoptic mites usually gather where the hair is thin and the skin tender. The first lesions are frequently found above the scrotum or udder and on the inner surface of the thighs. If the disease is not checked, infestations may cover the entire body. Affected areas lose hair and become covered with heavy crusts or scabs. The sarcoptic scab mite resembles the psoroptic scabies mite, but is slightly smaller, round rather than oval,

and has shorter legs. Like the psoroptic mite, there are three pairs of legs in the larval stage and four pairs on the adults and nymphs.

Sarcoptic mites are not confined to the surface of the skin, but penetrate through the upper layer and excavate burrows or galleries in which the sexes mate and eggs are laid. Each female may lay 40 to 50 eggs in a 2-month period. After depositing her eggs, the female dies in her burrow. When the young mites emerge from their eggs in from 3 to 7 days, they readily escape from their shallow burrows and spend at least a part of their lives on the skin surface. New generations of mites require just about 2 weeks to complete the cycle from egg to egg.

Sarcoptic, like psoroptic, scabies is a disease subject to quarantine and control measures wherever found. In fiscal year 1973, only four cases were reported from cattle herds across the nation.

Leg Mange or Foot Mange - The third scabies mite of cattle is Chorioptes bovis. In some literature, especially of the 19th century, it is the mite that causes leg mange or foot mange.

Like psoroptic mites, chorioptic mites have strong host preferences. They live on four host species: the cow, horse, goat, and sheep. In all animals, the feet and lower hind legs are the important sites of infestation. There is some scientific evidence that chorioptic mites may transfer between, and reproduce on, different host species of hoofed mammals, as from goats to cattle. Under usual farm conditions, these infestations do not spread from goats or sheep to cattle, or vice versa.

C. bovis lives in colonies on the surface of the skin, where they do not usually produce severe or conspicuous lesions. These mites are not likely to spread as rapidly over the body as does the Psoroptes mite. The mites have chewing rather than sucking mouthparts and subsist on sloughed skin debris and hair.

Control of Scabies - Because scabies infestations are considered contagious diseases, their existence must be reported to appropriate Federal and State agencies. Reporting sarcoptic and psoroptic or common scabies is mandatory, but as noted earlier, attitudes concerning chorioptic scabies are elastic. In any event, when reported, scabies control measures must be supervised by Federally or State designated officers.

Only three chemical compounds are recognized by the USDA as suitable scabicides; that is, drugs officially permitted for use under imposed quarantine restrictions and on cattle destined for interstate movement. These scabicides are water solutions of lime-sulphur, water emulsions of toxaphene, and water suspensions of coumaphos.

Lime-sulphur baths are used for lactating dairy cattle, or for animals destined for immediate or early slaughter. This compound is not highly lethal to scabies mites, and multiple treatments, sometimes four or even five, may be required to completely eradicate all mites everywhere on the body. The bath must be applied warm (95^{o}-105^{o}F.) Although administration is laborious, lime-sulphur baths have at least two advantages: (1) they are completely harmless, leave no tissue residues to contaminate meat or milk, and present no danger to the environment; and (2) equally important, a vatside or field test is available to determine the concentration of chemical in the dipping vat.

For dry dairy cattle and beef cattle, toxaphene is the drug of choice. It is safe when carefully administered, may be used in cold water, and is highly effective against the most severe infestations. One application will destroy all mites, but where mites are actually found, USDA regulations require two applications to assure treatment of all herd members. Treated cattle may not be designated for slaughter for 28 days after final treatment with toxaphene.

When coumaphos is used, all animals infested or merely exposed to diseased cattle must be treated twice. Cattle treated with this scabicide may be designated for immediate slaughter; no withholding period is required.

Ticks

At least 66 different species of ticks are found in the United States. They may be divided into two families: the Ixodidae or hard ticks and the Argasidae or soft ticks. The ticks that attack cattle include three species of soft ticks and 13 species of hard ticks. Ticks are blood feeders and may transmit disease-producing organisms to man and domestic animals. Ticks must get blood from an animal to exist. In animals, anaplasmosis and anthrax may be tick-borne. Rocky mountain spotted fever is tick-borne to humans. Not all ticks, however, transmit diseases. Nevertheless, they result in economic losses by causing anxiety, anemia,

inefficient feed use and require expensive treatments.

Tick fever, which handicapped the southern beef cattle industry for many years, was eradicated from the United States after an unrelenting campaign against two ticks, Boophilus annulatus and B. microphus, transmitters of the microparasite of the blood, Babesia bigemina. This infectious disease of cattle and the parasite which transmits it were the most serious obstacles faced by the cattle industry in the 15 Southern and Southwestern States. The Congress appropriated funds in 1906 to eradicate cattle fever ticks. The original area covered by B. annulatus included California, Oklahoma, Texas, Missouri, Arkansas, Louisiana, Kentucky, Tennessee, Mississippi, Alabama, Virginia, North Carolina, South Carolina, Georgia and Florida. B. microphus occured in about 30 counties in central Florida and in at least three counties in the southern tip of Texas. The Federal program began in 1907 and continued through 1943, when both species of cattle ticks were eradicated. There have been a few periodic reinfestations from tick-infested areas in Mexico, but each of them has been wiped out.

Two of the most important ticks which still cause problems and economic losses with cattle in this country are the gulf coast tick, Amblyomma maculatum, and the spinose ear tick, (Otobius megnini). The gulf coast tick is most numerous in a 150-mile-wide coastal strip from South Carolina to Texas. Before the eradication of the cattle fever tick, the gulf coast tick was ranked second only to Boophilus annulatus for the losses it caused. On cattle, this tick attaches itself to the inside of the outer ear. Cattle are attacked mainly during the late summer and early fall, but summer droughts sometimes delay the seasonal occurence.

The gulf coast tick is one of the species of ticks that may produce tick paralysis in cattle. A toxin is injected into the host at the time of feeding. Unless the parasites are removed, a paralyzing effect progresses into the medulla and death results from respiratory failure. There are four stages in the life of ticks--egg, larva or seed tick, nymph, and adult. The mature tick drops from an animal to the ground where it lays several thousand eggs. These eggs hatch into small flat larvae, or seed ticks, which crawl upon grass, weeds and bushes and await an opportunity to attach themselves to some animal or human being. As they feed on blood they become swollen.

They are very irritating and cause slower growth or rate of gain in animals. The larvae feed for several days, drop off the animal, find shelter in the ground, and molt into 8-legged nymphs which seek out similar hosts as those used by the larvae. After feeding for about a week they again drop to the ground, find shelter and molt into adults. Some species then mate, lay eggs and die after deposition, because the adults are non-feeding. Other species find another host and mate on the host, feed for several days until they reach adult size, drop to the ground and lay eggs. The female then soon dies.

The lone star tick derives its name from the conspicuous white spot in the rear angle of the back of the female. Often this spot has red or green tinges. The male is marked by two horseshoe-shaped areas at the rear side position of the body. The whitish spots that form the horseshoe outline may also have tinges of red or green. Usually, these markings in both sexes are very white, which contrasts sharply with the reddish-brown background of the body.

The palpi located at either side of the mouth of all stages are long; the second segment being much longer than the other segments. This condition is typical of the genus Amblyomma, and helps distinguish the lone star nymphs and larvae from the immature stages of other ticks.

The lone star tick lives on a wide range of hosts, including many species of birds. Smaller rodents serve as hosts for the larvae, but dogs and foxes may also carry large numbers. Little, if any, host specificity seems to be exhibited by the lone star tick. Host size and habits may govern the host-parasite relationships for this species.

In the larval stage, thousands of ticks from the same egg mass gather on clumps of low-growing plants. When a host comes in contact with these plants the ticks immediately transfer to the host. The result is hundreds to thousands of bites. The Rocky Mountain wood tick, Dermacentor andersoni, and the American dog tick, D. veriabilis, are the primary vectors of Rocky Mountain spotted fever in the United States.

The Rocky Mountain wood tick is a common parasite of mammals in the West, both in terms of disease transmission as well as of blood sucking parasitism. In addition to Rocky Mountain spotted fever, this tick transmits Colorado tick fever, Q fever and tularemia, and causes tick paralysis. The tick is distributed

throughout parts of Oregon, Washington, Idaho, Montana, North and South Dakota, Wyoming, Nebraska, Colorado, New Mexico, Arizona, Utah, Nevada and California.

Rocky Mountain Spotted Fever - This disease is caused by the agent Rickettsia rickettsi, and is transmitted to man by the bite of an adult Rocky Mountain wood tick. Both males and females transmit this disease, and are active from April through July. The disease organism inflames the inner lining of the blood vessels, resulting in chills, high fever, headache and a rash on wrists and ankles. If untreated, the disease may be fatal, but broad-spectrum antibiotics such as tetracycline or chlorampenicol given promptly after diagnosis are very effective.

A tick must be attached for several hours before it can transmit the agent of spotted fever. Persons living or working in tick-infested areas should examine themselves carefully for ticks, stripping daily and examining their bodies, especially hairy regions. Children should be examined twice daily.

If a tick is found, remove it with care. The best method is to pull gently, being careful not to crush the tick, thus avoiding contamination of the broken skin with the disease agent. Apply an antiseptic to the site of the bite.

Those working in tick-infested areas should wear clothing so that each outer garmet overlaps the one above it, to prevent penetration of ticks between clothing layers. Spraying outer clothing with an insect repellent containing deet also affords effective protection.

Control - The very best prevention of infestation is to maintain cattle on improved, mowable pastures. Cattle having access to brushy areas are almost always infested, in States where the tick is found.

Control of existing infestations on cattle can be achieved by dips, sprays, and dusting. Insecticides include coumaphos, lindane, toxaphene, and malathion. Spraying is the most widely used method of applying insecticides to control ticks. Coumaphos, lindane, and toxaphene sprays mixed according to directions given will control ticks. Treatments may have to be repeated at 30-day intervals to keep ticks under control.

Dipping is also a good method of applying insecticides

for control of ticks and lice where dipping vats are available. Arsenical compounds and toxaphene are most commonly used as dips.

Dipping is probably the most practical way to treat large herds of cattle to control ticks. The cattle are forced through a chute into the vat and must swim through the dip to the opposite side. They are completely submerged momentarily, and they remain in the dip long enough to assure complete wetting.

Spinose ear tick infestation requires special medication because dipping and spraying will not wet the inside of the ear sufficiently to kill the ticks. Some ticks can be removed manually, and coumaphos or ronnel dust may be injected directly into each infested ear canal with a special dose syringe. Treatment of each ear with aerosol sprays of organic phosphates, chlordane, or lindane is also beneficial.

GRAZING AREAS - RANGELAND, PASTURES AND WOODLAND

About one-half of the total land area of the continental United States is used for grazing of livestock. This area amounts to about 1 billion acres. The forage produced by this area furnishes from 75 to 80 percent of all the feed for beef animals. This forage is in the form of grasses, forbs (non-grasslike herbs), grass-likes, and shrubs.

Rangeland

The principal native grazing lands of the United States are in the West and South. Those in the West are predominantly grasslands, or desert shrub lands that are too dry for farming unless irrigated. However, an important part is mountain woodland, which is moist enough for trees, but generally too rough for cultivation. The natural grazing areas of the South are forested lands, wet prairie, prairies, and marsh. The natural grazing areas of the West and Southwest are generally classified as native rangelands. In the South and East, where rainfall is more abundant, natural grazing areas are frequently classified and managed as permanent pastures rather than native rangelands. Native rangelands are usually characterized by limitations of plant growth more so than is true for the pastures of the South. Lack of sufficient water is the predominant limitation; however, rough topography, remoteness, soil adversities and severe temperatures are also restrictions to plant growth.

The southern pineland division of the South extends

from central Texas into southern Florida and northeastward to Kentucky and Virginia. This division is composed of southern pineland, oak forests of eastern Texas and Oklahoma, hardwood areas of the southern Mississippi Delta, and the poorly drained prairies or marshlands along the Gulf Coast in Texas, Louisiana, and in central and southern Florida. Cattlemen can, in some respects, use the pastures almost year-round. New species of grasses and legumes and new methods of fertilizing pastures have extended the grazing period even longer. The high rainfall is usually fairly evenly distributed throughout the year. The southern climate permits the growth of a great variety of pasture and forage plants. Many native plants, such as wiregrass, bluestems, broomsedge, panicums, reeds, and browse plants furnish grazing for beef cattle in the South. Carpet grass has spread extensively into the woodlands in many places. The acreage of improved tame pasture is increasing very rapidly.

Question No. 223 Ticks must get _____ to exist.

Question No. 224 What are the two chief ways in which ticks cause damage or economic losses?

a. _____

b. _____

Question No. 225 Several insecticides are effective in tick control. What are the two principal means of applying them?

a. _____

b. _____

Pastures

In addition to grazing in open (prescribed burned) woodlands, and on natural prairies, there is much grazing of cutover tracts and abandoned fields that have not been regenerated with timber. Grazing is primarily on tame plants in improved farm pastures, although there is some grazing of abandoned, cultivated farm fields and farm woods. The pastures are usually planted to grasses and legumes that have been introduced from other countries. These improved pastures have a much higher carrying capacity than the unimproved native pastures, primarily from the use of fertilizers and the tame species' ability to use the fertilizer. Some of the more productive improved pastures will carry two cows or steers per acre for a grazing season of 8 months or more, where native pastures will only carry one cow per 6 to 10 acres.

With the increased interest in beef cattle production in the South, additional acreage is being cleared and

put into improved pastures and hay production. Many of the area's fields, which were once cotton fields, are now being used as improved pastures and for soybeans. Pasture forage is the most readily available, the easiest grown, and the cheapest of all feed for livestock production. The South's climatic conditions make year-round grazing programs possible, or nearly so, with improved pastures and proper amount of warm and cool season grasses. Good progress is being made in the South to develop, expand, and use improved pastures. Various systems have been developed to take advantage of the warm season, cool season and winter growing times of the various species of grasses. In areas where the entire grazing year cannot be covered, hay is produced or other supplemental feeds are produced.

Woodland

The grazing in woodland areas is on areas that are in regeneration, or that are prescribed burned regularly. The usual method of regenerating a timber stand in the South is a clearcut, with some type of site preparation. After the timber is clearcut and the site prepared for tree seedling planting, many species of grasses, forbs, and shrubs also regenerate on the prepared site. This forage is available until the timber canopy begins to close. This period of 10 to 15 years will produce considerable amounts of usable forage. Prescribed burning, at 1- to 5-year intervals, also is used in the longleaf-slash pine types to reduce the rough, undesirable understory competition and remove the pine needle cast. Grasses and forbs respond and produce fairly good grazing for 2 or 3 years before it needs to be reburned. Woodland grazing varies from 5 acres per cow on a regeneration area to as much as 40 acres per cow on a heavy, unthinned timber area. As a general rule, livestock on woodland areas need some supplemental feed during most of the year except late spring and early summer.

Management of Grazing Areas

The South has such a wide range of conditions (moisture, soils, temperatures, etc.), that grazing programs must be varied in keeping with local conditions. Vegetation depends on many factors, including soil type, drainage, soil fertility, climate, physical factors, and past management. A careful study of all these factors is essential for a livestock operator to be able to take full advantage of practices that will allow utilization, and improve the carrying capacity of the grazing area. Basic principles of pasture management are the same; however, the methods of accomplishment may vary widely from one area to another.

The things that must be considered under good management are proper seedbed preparation, planting, liming, fertilization, weed control, brush control, water use, water distribution, grazing management, erosion control, drainage, location of supplemental feeding equipment, location of disease and insect treatment facilities, and adequate shade.

Seedbed Preparation

The proper seedbed preparation and planting of good seed is probably the best opportunity for increasing the productivity of many grazing areas. Give the same care to planting of pastures or rangeland that is given to planting of row crops. Unfortunately, this is not very often done and is the cause of many failures. Seedlings cannot compete with large, established plants for moisture or sunlight. Seeded grasses do much better in clean ground that is free of other plants. In the humid part of the South, proper preparation of the land consists of plowing, disking, fertilization, harrowing, and rolling the land to provide a firm seedbed. Disk rocky land with a brushland plow, which has individual spring-mounted disks that ride up and over rocks and stumps without raising the rest of the disks.

Planting

Plant seed at the proper rate, depth, and time of year. Buy seed of adapted varieties, with high germination and purity.

Although reseeding is very important, only a small part of the range area can be improved by seeding, using present technology and economic limitations. Natural recovery of vegetation from reduced grazing pressure or deferment, or removal of competing vegetation, may be less costly and more practical than reseeding, in some areas. Because reseeding is very costly, the sites having good soils and moisture should be seeded first. Some grasses, such as coastal bermuda grass, are planted by sprigging instead of by seeding, because of poor seed production. Natural reseeding is often an effective way to increase carrying capacity. In this method, the grazing is deferred on the area to be reseeded until the existing grasses have produced seed. After the seed has started to shatter livestock can be used to trample the seed into the soil, and in effect, plant the seed.

Most soils in the South are acid because of the leaching effect of high rainfall. Crops also remove basic elements such as calcium, magnesium and potassium. Therefore, you should have the soil analyzed, and add lime or other minerals as needed. Usually, the

addition of lime will take care of this need and keep the soil in a neutral state needed for best growth of most crops. In addition to correcting soil acidity, lime also supplies calcium and magnesium, speeds the decay of organic matter, and affects the availability of essential elements. Lime aids the fixation of nitrogen by soil and plant organisms, improves yields, and aids soil structure. Lime also reduces the strength of some toxic elements. In some cases the soils may be alkaline, and gypsum or sulfur may have to be applied to lower the pH to neutral. Under most soil conditions, apply lime to pastures once every 4 to 6 years.

Question No. 226

What is the range of acres per cow for grazing woodland areas? _____acres per cow to _____acres per cow.

Fertilization

Fertilizer is a necessary element that has a definite influence on both the quantity and the quality of the forage produced. Plants use nitrogen, phosphorus, potassium, and other minerals and trace elements. Animals convert the minerals into carbohydrates, fats, proteins, and mineral nutrients for growth and adding weight gains. Livestock remove the minerals and plant food from the soil; over time, the pastures or rangelands will need fertilization if they are to continue to produce satisfactorily.

Phosphorus is the mineral that is most often deficient in soils of the South, but many soils are also deficient in nitrogen, potash (potassium), calcium, sulphur or other minerals. Some soils are deficient in two or more minerals. Some minerals, such as nitrogen, phosphorus and potassium are needed in rather large amounts. Iron, manganese, zinc, copper, molybdenum, boron and chlorine are needed in small amounts and are called trace minerals.

Weed Control

Weed control is also one of the most important factors in good management of a pasture. Livestock prefer grass and do not graze to any extent on weeds. Therefore, the weeds may outgrow grasses and, in some cases, eliminate the grasses.

There are two kinds of weeds. One kind is palatable to livestock and is grazed along with the tame or native grasses and legumes. Those that are not palatable are not grazed or kept in check by grazing. The palatable weeds compete with desirable grasses and legumes. Many of the plants that farmers consider as weeds are actually fair or good range forage plants,

especially on ranges where, under unfavorable conditions of growth, the same aggressiveness and vitality that makes a species a pest in agricultural land invest it with utility if it is palatable.

The weeds that are most often objectionable are those that are not palatable and are not kept in check by grazing. They are able to increase and dominate a pasture unless measures are taken to reduce them. Some palatable species of objectionable plants are poisonous to livestock, and may endanger the life of animals that eat them. They harbor insects and diseases that may become destructive to the animals, grasses or legumes. The objectionable weeds reduce the grazing capacity and add to the cost of pasture upkeep. Weeds can be controlled by herbicides, mowing, proper fertilization and regulated grazing. Overgrazing must be avoided, as weeds will take advantage of the opportunity to get established. Good pasture management requires that the right number of livestock be kept on the grazing areas. Apply lime and fertilizer to the pastures as needed, to aid in weed control. Anything that is done to encourage a uniform and vigorous growth of pasture plants will tend to hold the weeds in check.

Sheep prefer many weeds and often effectively control weeds in an area usually grazed by cattle. When proper stocking rates are followed, sheep may be used in a mixed grazing system with beef cattle to the mutual advantage of both species.

Control weeds by mowing the pasture before the weeds go to seed. If you follow this practice for a few seasons, the weeds will nearly disappear. Mowing may prevent the development of seed in annual weeds and may prevent the spread of perennial weeds. If seeding of the weeds can be prevented, the spread of these plants will be confined to the roots and stems that grow underground. Regular mowing will also prevent weeds from shading desirable grasses and legumes. Mowing will also keep the desirable plants at a uniform height and maturity so that the entire pasture is palatable to the grazing livestock.

Mowing, when compared to control by herbicides, has some disadvantages. These include longer time needed to cover pastures. Sprayers can reach and cover fence rows, rocky areas, and areas with stumps; the right herbicides properly applied will kill perennials, where mowing only keeps them from producing seed.

Herbicides are broadly classified into three groups:

Soil sterilants, which kill almost all plants; pre-emergence sprays, which kill weeds as the weeds germinate; and post-emergence sprays, which kill weeds on contact. The soil sterilants can be temporary, remaining in the soil from a week to 2 years, or semipermanent, which can prevent growth for as long as 4 years. The soil sterilants are usually used along fence rows or around edges of buildings or corrals. The pre-emergence type is generally used when establishing new pastures to allow the planted seed to get ahead of the weed competition. This type of herbicide is usually selective in what it will kill.

The post-emergence type is used to treat weeds after they have started growth. These herbicides are usually selective because they will kill broad-leaved weeds without causing permanent damage to the desirable grasses. The herbicides will, however, kill legumes, as they are broad-leaved plants.

The weather and the stage of growth have a lot to do with the effectiveness of any post-emergence herbicide. Best results are obtained if these herbicides are applied when the weather favors weed growth. Hard rains and high temperatures will reduce the effectiveness of the herbicides.

Brush Control

Brush and weed trees shade the area underneath their crowns, and restrict the growth of desirable plants. Usually, heavy brush infestation is caused by overgrazing, which gives the brush and weed trees a chance to grow and expand. These conditions reduce the desirable forage plants and reduce the carrying capacity. Brush control methods include herbicides, mechanical treatment, fire and good grazing management. Herbicides are often used to reduce the amount of brush and then the area is reseeded. Mechanical methods include mowing, bulldozing, cabling, shearing, chaining, roller chopping and hand treatment. The axe, saw and grubbing hoe are still effective brush-control instruments, but the development of crawler-type tractor attachments may do the job faster, easier and at a much reduced cost, especially for large areas. The attachments include brush, disk, rail, roller cutters, cables, chains, shearing blades, raking or piling blades, root plows and rippers.

Fire is used mainly to remove old growth and kill the tops of brush and trees. Fire removes the old, unpalatable, herbaceous material of desirable plants and makes the now-palatable regrowth or sprouts

available for grazing. Some control is accomplished by grazing on the sprouts before they grow out of reach of the livestock.

Water Use

A good water use and distribution program is a major part of good management. Excess water can often be channeled into ponds or into terraces, which will help distribute the water and hold it on the area longer to make fuller use of the water. Water developments attract livestock into areas that are poorly utilized. By being able to close off water in an overused area and provide it in an underused area, livestock can be forced to make better use of the grazing area.

Properly spaced watering places will also keep livestock from walking off their gains in weight. Spacings of 1/4 mile are most convenient for animals and will support best gains, but returns on the investment may not justify such extensive water developments.

Watering places should not be more than 2 miles apart on level or gently rolling areas, and not more than 1/2 mile apart where there are thickets, down timber, steep areas or mountains that hamper travel.

Grazing Management

The items that make up grazing management are grazing intensity, distribution of livestock, season of grazing and kind of livestock. These items must be considered and managed properly to make full use of the grazing area and the production from that area. Overgrazing is a costly mistake that is all too common in the South. With overgrazing, the soil is left exposed and usually erosion takes place. Overgrazing will also injure the desirable forage plants and if continued long enough, will eliminate them. The grazing capacity is reduced, which will compound the overgrazing if the same number of livestock are allowed to continue grazing. Much of the overgrazing is caused by poor distribution of livestock. By allowing the livestock to concentrate on an area it will be overused or overgrazed, while another area nearby will not be used at all or very little. Livestock spend a lot of time near watering places, areas with certain types of vegetation and areas that are fairly level. Livestock can be distributed by fencing watering places so they can be controlled, by using salting places to move livestock around, by herding livestock into areas that are under-used and by placement of supplements or minerals.

The season of grazing is also a factor to be used properly. Graze cattle on pasture or areas with

mostly cool season grasses during early spring and late summer or fall, perhaps even in winter. Mainly warm season grasses should be grazed in the late spring and summer. A comprehensive grazing plan, based on range condition and forage types, contributes strongly to the maintenance or improvement of range condition. The first step in the grazing plan is to determine the best season of use for each portion of the range. Do not graze any grass until it has grown enough leaves to replace the food reserves drawn from the roots to start its early growth.

The kind of livestock best suited to an area depends upon the vegetation available or the steepness of the terrain. Cattle eat mostly grass, while sheep eat more forbs and shrubs, and large wildlife eat more shrubs along with some forbs and some grass. Therefore, if an area has more forbs and shrubs it may be better suited to sheep and wildlife than for cattle. If it has more shrubs and brush it may be better suited for wildlife. If the area is rough and steep sheep may be better suited to graze there. Some areas should be used by cattle, sheep and wildlife for the best use of the forage available.

Erosion Control

Overgrazing, trailing, compaction, use of erosive soils, use of too steep an area and other uses of an area can cause erosion problems. Many erosion problems can be eliminated by better distribution to prevent overgrazing or concentration, fencing watering places for control, blocking trailing areas, fencing out erosive soils or streambanks and by not using areas that are too steep for proper grazing use.

Grass, especially the sod-forming kind, is an excellent cover for soil protection. By holding rainfall where it hits the ground and by reducing the speed of overland flow, grass becomes one of the best means of preventing erosion. Where grasses and legumes are grown, the soil has a more porous structure, soil organic matter is increased and water can be absorbed more rapidly by the soil. On sodded areas, the vegetation breaks the fall of the raindrops and prevents sealing of the soil surface. In some areas, especially where the soils are thin or impervious and the slopes are very steep, conditions for water absorption are very unfavorable and additional water-retardation measures are needed. Small retention dams installed in headwater drainages and gullies, contour furrowing, water spreading and intensive vegetative treatment of steep areas are included among the extra structures and measures used under these conditions.

Drainage

Many areas in the South are boggy and swampy; the problem of drainage in these areas is very important. The desired grasses and legumes will not grow satisfactorily in poorly drained soils.

Many of the wetlands and swamps serve the needs of wildlife, and a balance must be maintained between wildlife and livestock needs. A beef cattle production problem that is peculiar to the South involves the efficient use of marshland ranges. Extensive, yearlong grazing is provided by the coastal prairie and marshland types that occur on low, poorly drained lands, along the Gulf and Atlantic coasts. The marshgrass type lies along the coastline, with the coastal prairie located on slightly higher ground between the marshgrass and flat pinelands. The coastal prairies and marshgrass provide forage for many large livestock operations. Cattle producers do not have to plow, plant or fertilize to grow forage in these areas, but they do have to use good judgement and sound management. The objectives are to use all of the range, use only half of the growth of grass and to move on and off the marshes at the right time. Cattle are reluctant to go more than 1/4 mile into a marsh when it is covered by water. Some of the best grazing is sometimes isolated by a few inches of water. To use all the range, the owners must build cattle walkways, levee-type roadways that stretch across the marshes from one ridge to another. Using draglines, the owners can ridge up the soil from alternating sides. This technique does not leave a continuous ditch that would drain the marsh or let salt water come in. The borrow pits become watering holes, and the spaces between enable livestock to leave the walkways at almost any point. Deferred grazing is another useful range management practice in the marshlands. The livestock are taken off the marshes for periods of 90 days or more during the growing season, letting the grass recover from heavy grazing. In Louisiana, many cattlemen drive their cattle to piney woods ranges about mid-April and back to the marsh during October. Mosquitoes and other pests are worse in the marsh during the summer, and grasses on the salt marsh are best in winter.

Supplemental Feeding Equipment Location

In much of the South, especially on wooded ranges, grasses and legumes that are not fertilized may become deficient in nutrients and should be supplemented. Research has shown that native grass species will not meet the daily nutrient requirement from October to as late as mid-March. The limiting factor in beef production for this period may be the quality of forage

rather than quantity. Cattle stocked on woodland ranges may subsist without supplemental feeding, but calf crops are low, weaning weights are meager and death losses are high. Supplemental feeding on wooded ranges is best done in movable troughs to avoid trampling damage to the range area and to avoid feed waste. Some supplemental feeding is done by use of tanks of liquid feed and licking wheels. The tanks are portable to avoid overuse of the area. The location of the portable troughs or tanks is very important, as much of the distribution of livestock can be accomplished by planned movement of the feeding equipment. By moving the equipment into areas that have light grazing use and away from water, the forage will be better used. Having water in one location, salt in another and supplemental feed in another will help move the livestock around and improve distribution of use.

Shade will help distribute livestock if it is properly located. Beef cattle can do without shade during summer heat, but they always do better if shade is available. Too often, not enough attention is paid to providing shade as well as sufficient fresh water for cattle during hot weather. The tall-growing species of trees make the best shade for permanent pastures. In the hot summer, most cattle will head for the nearest shade tree after they have eaten their fill of grass. Brahman cattle are the one exception; they will often lie in the sun to chew their cud.

Location of Disease and Insect Treatment Facilities

Put back rubbers near areas where cattle gather, such as shade or water facilities. Install a dipping vat, spray chute or squeeze chute with corral facilities to reduce the cost of these facilities and aid in treating affected livestock

RANGE IMPROVEMENTS ON FORESTED LANDS

Forested range areas can be used without any improvements at all, but would often result in poor use, lost livestock, overuse of some areas, and underuse of other areas. Livestock may get on other property and, in general, no way to control or manage the livestock and the resource would be available.

Improvements need to meet several objectives: They should do the intended job, be cost-effective, and easily maintained. Design them to minimize conflicts with other resource uses and meet good standards of materials and construction. Improvement standards should be flexible as new methods of construction, new

materials and better designs are continually being found or invented.

Fences

Good fences are essential in a successful beef cattle production program, but elaborate and expensive fencing is not necessary. Proper fencing helps you apply many management and herd improvement practices such as control of livestock, distribution of grazing, specialized grazing systems, planned breeding programs and protection of areas from grazing. Fences also reduce mixing of livestock of various ownerships and reduce the possibility of livestock loss. Fencing is expensive, so you should carefully select the type best suited for a particular operation.

Uniform construction standards for fencing cannot be set to fit all fencing situations. On-the-ground needs and coordination with other uses will determine the criteria to be used. Standards should be set for the design of line braces, corners with braces, and gates. If the fence is to be on a boundary between different owners the placement of the fence becomes very important for such factors as ownership of the fence, placement on the dividing line or on one side or the other; who will maintain the fence, who pays for the materials, labor or both.

Install gates or cattleguards with a gate at all trail, road and livestock crossings. Build one gate in each half-mile of fence, unless impractical, with a minimum of one per mile. Gates should be well constructed and be easy to open and maintain. Put cattleguards at all permanent road crossings where mechanized traffic justifies the installation.

Cattle Handling Facilities

The handling facilities should include the following:

1. Holding pen or pens and cutting pens
2. Working chute and catwalk
3. A funnel-shaped entrance to the chute
4. Headgate and squeeze
5. Loading chute

Other items that could be included:

1. Calf table (for cow-calf operations)
2. Scales (for demonstration areas, especially)
3. Dipping vat or spray pen
4. Feed troughs
5. Watering troughs
6. Back rubbers
7. Spray gates
8. Trap gates

9. Hay racks
10. Working wings

No single plan for cattle handling is best for all areas, farms, or ranches. However, certain features and construction details are useful on any facility. Plan your handling facilities based on these factors:

1. Location is convenient to the range or pasture and has a nearby water supply.

2. Strong, solid and large enough to hold the number of livestock to be worked.

3. Arranged so that livestock can be easily handled and quickly sorted.

4. Planned for economy of construction and maintenance.

5. Use materials that are economical and locally available.

6. Location should be in a well-drained area and on a soil that will absorb moisture readily. The site should have a road that is accessible by livestock trucks in all kinds of weather.

7. Provide for the safety of all personnel and for the animals to be handled. Provide walkways and escape points if necessary.

8. The system should have at least one large pen for holding the herd, a chute for separating or crowding work and at least two smaller pens in which to put the separated livestock.

9. Provide chutes, squeeze chutes, ramps and head gates for use in branding, dehorning, castrating, spraying, loading, unloading and weighing livestock.

10. Designed so that the livestock can be worked by men on foot as reliance on horses is disappearing. Minimal labor to handle the livestock should be considered in the design.

11. Mount the gates so that they swing in the direction the livestock will be moved, if possible, and use the gate as a funnel.

Question No. 227 What is the objective of fence maintenance?_____

Water Facilities

Good, clean water is a must in any livestock program. Regardless of whether water is provided by wells, streams, springs, ponds or storage tanks, it must be available in abundance at all times to livestock in all pastures or in all other grazing areas. The water supply must be pure and well protected, because some cattle diseases are harbored in poorly drained, muddy holes and pools. The cheapest and best system is to have water in each pasture or unit. Farmers who have running streams in pastures or wooded grazing areas are very fortunate. If they do not have running streams in each grazing area, a water facility should be developed or constructed in each one. Livestock water facilities should only be developed if they will aid good range management. They should be tied into the management plan for the grazing area. Consider future needs under more intensive management, as the locations may change. For good sanitation, fence livestock out of ponds and, in some cases, stream areas. Some of the worst livestock diseases, including leptospirosis, anthrax, black leg, brucellosis and tuberculosis may be spread by livestock wading in ponds, either drinking contaminated water or contaminating the water. Parasites, such as liver flukes and microscopic protozoans (coccidiosis), completing part of their life cycle in water areas, and are picked up by animals eating vegetation with the parasites on the leaves.

The location, amount and reliability of livestock water is a limiting factor in applying systems of intensive management. Livestock water must be dependable for a grazing unit to be properly used at the right time. Water must be located so that it contributes to the best livestock distribution possible. Check the reliability and quantity of springs and seeps over a long period of time before spending money to develop them.

Water requirements of livestock are influenced by a number of physiological and environmental conditions. They include the rate and composition of gain, pregnancy, lactation, physical activity, type of ration, salt and dry matter intake, and environmental temperature.

The minimum water requirement of livestock is that needed for body growth, for fetal growth or lactation and for losses by excretion in the urine, feces, sweat or by evaporation from the lungs or skin. The amount of urine produced daily varies with such things as activity of the animal, air temperature and

water consumption. All of these factors and their interplay make the minimum water requirements difficult to assess. Feeds themselves contain some water, and because the oxidation of certain nutrients in feeds produces water, not all must be provided by drinking. Feed such as silages, green chop or pasture are usually very high in their moisture content, while grains and hay are low. High energy feeds produce much metabolic water while low energy feeds produce little. The major influences on water intake in beef cattle on typical rations are dry matter intake, environmental temperature and lactation. Table 28 is a general guide to water requirements, and it must be used with considerable judgement.

Question No. 228

Name four facilities to include in a handling system for beef cattle:

a. _____

b. _____

c. _____

d. _____

Supplemental Feeding Facilities

The forage on forested ranges in the South is seriously deficient in nutrients during the fall and winter. Many areas are deficient in some minerals all year. To correct this deficiency, supplemental feeding is generally used. Livestock may survive without the supplements, but they will be weak and easily attacked by diseases, parasites and insects. Death losses will often be high and calving rates drop below 50 percent. Supplemental feeding reduces the loss of livestock, and the calving percentage will rise in relation to the quality and quantity of supplemental feed.

Supplemental feeding can be accomplished by dumping the supplements on the ground, but this method is very wasteful and could be hazardous to the health of the livestock. Some type of feeder is usually used to keep the supplement off of the ground and keep livestock off and out of the supplement. Livestock will trample, waste and contaminate the supplements if allowed to do so. There are a number of types of equipment for feeding supplements: feed bunks (with or without roofs), salt block stakes, liquid tanks with self-feeder wheels, hay racks (with or without roofs), self-feeding movable hay racks (as the hay is eaten the livestock push the rack closer to the stack of hay), wind rotated salt or mineral feeder (keeps the feeder turned downwind, and prevents loss of supplements by action of wind and rain) and creep

Table 28. Estimated daily water intake of cattle

Month	Mean Temp.		Cows		Bulls	Growing cattle**			Finishing cattle			
			Nursing calves*	Bred dry cows & heifers		400lb.	600lb.	800lb.	600lb.	800lb.	1000lb.	120
	°C	°F	GAL	GAL	GAL	GAL	GAL	GAL	GAL	GAL	GAL	
Jan.	1	36	11.0	6.0	7.0	3.5	5.0	6.0	5.5	7.0	8.5	
Feb.	2	40	11.5	6.0	8.0	4.0	5.5	6.5	6.0	7.5	9.0	1
Mar.	12	50	12.5	6.5	8.6	4.5	6.0	7.0	6.5	8.0	9.5	1
April	19	64	15.5	8.0	10.5	5.5	7.0	8.5	8.0	9.5	11.0	1
May	21	73	17.0	9.0	12.0	6.0	8.0	9.5	9.0	11.0	13.0	1
June	23	78	17.5	10.0	13.0	6.5	8.5	10.0	9.5	12.0	14.0	1
July	31	90	16.5	14.5	19.0	9.5	13.0	15.0	14.5	17.5	20.5	2
Aug.	30	88	16.5	14.0	18.0	9.0	12.0	14.0	14.0	17.0	20.0	2
Sept.	23	78	17.5	10.0	13.0	6.5	8.5	10.0	9.5	12.0	14.0	1
Oct.	20	68	16.5	8.5	11.5	5.5	7.5	9.0	8.5	10.0	12.0	1
Nov.	10	52	13.0	6.5	9.0	4.5	6.0	7.0	6.5	8.0	10.0	1
Dec.	2	38	11.0	6.0	7.5	4.0	5.0	6.0	6.0	7.0	8.5	

*Cows nursing calves during first 3 to 4 months after parturition - peak milk production period.
**Requirement will be a little less for wintering on range.

feeders. Most supplement feeders should be portable, either small enough to pick up and move or mounted on skids. Move feeders often enough to avoid damage to the resource by the concentration of livestock which results in trampling.

HANDLING PRACTICES OF BEEF CATTLE

Be constantly on the alert for new scientific developments or new practices that may be beneficial to your program. Before adopting new developments, investigate them very thoroughly for hidden costs, training requirements, and availability of materials. Determine how they will fit your operation.

Castration

Castration is removal of the testicles from male animals. Good managers generally castrate all male calves that are not intended as breeding animals. When and if there is a change in our grading and marketing system the recommendation to castrate could change. Bull carcasses are leaner than steer carcasses. Consumers prefer the leaner cuts of meat in today's market. Steers are preferred by feedlot operators because they are more docile than bulls. Other reasons for preferring steers over bulls are:

1. Preferred beef qualities--texture, tenderness and flavor--usually develop better in steers than in bulls.

2. There is a better balance in body development; bulls develop heavy crests and heavier forequarters than hindquarters. Most of the high quality cuts of beef come from the hindquarters.

3. Steers sell for a considerably higher price than bulls, whether they are sold as feeders or as slaughter animals.

4. The castration prevents indiscriminate breeding.

Castration is best done when the calves are 4 to 12 weeks old, but bulls of any age can be castrated. The older the animal is at the time of castration, the greater will be the shock and risk. The calves should be castrated before 8 to 10 months old to prevent a staggy appearance and a lower price. If the bull calf is to be fitted as a show steer, some producers prefer to allow the calf to develop somewhat in the neck before castration.

The best time to castrate calves is in cool weather--spring and fall--when there is no danger from blow flies or screwworms. Fair weather is preferred as this promotes healing and helps prevent infections. When there is doubt about the presence of flies, a fly repellent such as pine tar should be applied to the wound.

There are several methods of performing the operation, all of which might be classified into two categories: the use of a knife, and the use of instruments which do not make an incision.

The most common method is by using a sharp pocket knife. The hands of the operator, the knife, and scrotum of the calf should be washed with a mild antiseptic or disinfectant. The calf should be thrown on his left side and his feet securely held, so that the scrotum is convenient to the operator. There are two methods of making the incision in the scrotum: (1) Grasp the lower end of the scrotum, stretch it tight, and cut off the lower third, leaving the ends of both testicles exposed. Then pull the testicles out one at a time and sever the spermatic cord up close to the stomach by scraping with the knife. This procedure provides good drainage, which is essential, but it does not provide opportunity for the development of cod fat, which is desirable in the show ring and in the feedlot. Many farmers use this method. (2) Pull one testicle down at a time and hold so that the skin of the scrotum is tight over the testicles. Make an incision, parallel to the midline, on the outside of the scrotum next to the leg, both through the scrotum and the membrane around the testicles. Start the incision at about the top one-third of the testicle and let it extend to the lower end of the scrotum in order to be sure to have good drainage. Then remove the testicle in the manner previously described. This method has the advantage of allowing for the full development of cod fat.

There are two bloodless methods of castration. One method involves the use of a special clamp or pincers, the most common type being known as the Burdizzo castrator. The procedure for using this instrument is to work the spermatic cord of one testicle to the side of the scrotum and clamp the Burdizzo on it about 1 to 2 inches above the testicle and hold it for a few seconds. The same procedure is then followed on the other testicle. The instrument is made with lips or stops on each side of one jaw to prevent the cord from slipping out. The action of the

instrument completely crushes or severs the cords and associated blood vessels which causes the testicles to waste away because of lack of circulation of blood. In using this instrument, exercise care not to sever the blood vessels in the mid-line of the scrotum. This instrument does not break the skin of the scrotum, hence there is no external bleeding. This procedure is considered a great advantage because it prevents screwworm infestations and infections. Steers castrated by this method usually develop largerand fuller cods by the time they are ready for market, which is highly desirable by cattle feeders.

The other method of bloodless castration calls for the use of an Elastrator. This tool stretches a specially made rubber band so that you can pull both testicles to the bottom of the scrotum, slip the instrument over them and release the rubber band above the testicles. The action of the rubber band shuts off the circulation of blood to the testicles and causes them to waste away. The scrotum and testicles slough off where the rubber band is applied, thus resulting in a small cod in finished steers, which is often considered undesirable. This method works best on calves about 1 month old.

The Elastrator is not highly recommended, primarily because of the danger of tetanus and other clostridial infections. The rubber rings sometimes fail to hold and void the operation. Complete removal of the scrotum is also objectionable to some stock producers.

Dehorning

Purebred cattle of the horned breeds that are raised for breeding purposes generally should not be dehorned because properly trained and polished horns add to the attractiveness of show cattle and also have a high sales appeal. Both steers and heifers that are intended for finishing in the feedlot should be dehorned for the following reasons:

1. Horned cattle bruise each other, lowering the carcass value.

2. Horned cattle may hurt the person who feeds and handles them.

3. Cattle with horns require more space on feeding grounds, at feed troughs and in shipping by truck or rail.

4. In most herds of horned cattle there are those that boss and fight others away from the feed.

5. Dehorned cattle usually sell from 0.1 cent to 0.2 cents per pound more than horned cattle.

There is another side to this question:

1. Extra labor and equipment is required.

2. Ugly scars may develop if dehorning is not carefully done.

3. There is some danger of loss from infection, screwworms and excessive bleeding. However, most practical cattle producers regularly dehorn, castrate and brand their cattle all at one handling.

When to Dehorn - Generally, it is best to dehorn calves before they are 3 months old. The younger the better, because they are easier to handle, bleed less and suffer less setback from the operation. Dehorning should preferably be done in fair, cool weather when there are no flies to infest the wounds. There would probably never be any one date that would meet both these conditions, which means that a farmer would either have to handle the cattle several times a year or compromise by dehorning in cool weather, regardless of the different ages of the calves. Cattle of all ages can be successfully dehorned. Horns become hard and attached to the skull at about 3-1/2 to 4 months of age.

Methods of Dehorning - There are several ways of successfully dehorning cattle; often the age of the cattle, the tools, labor and equipment available will determine which method you use. The various means of dehorning might be classified into three methods: chemical, mechanical and by breeding.

Chemicals such as caustic potash or caustic soda, may be used to dehorn very young calves--up to about 10 days of age. These chemicals can be bought at livestock supply houses in stick or paste form. In calves only a few days old, the undeveloped horn, or horn button, may be barely evident. Clip the hair from an area around the horn button and apply a protective ring of Vaseline around the base of the horn. Then rub the horn button with a caustic stick slightly dampened with water until there is slight bleeding over the area, or apply the paste according to directions on the container. These caustic chemicals will severely burn unprotected skin. This is the reason for using the vaseline ring to protect the face and eyes of the calf. Be careful

not to get the material on your hands or body. The end of the stick in your hand should be well wrapped with paper. In a few days a heavy scab forms over the horn button. The scab usually drops off in about 10 days. The caustic chemicals burn and completely destroy the horn-forming cells in the skin. Calves treated by this method must be protected from rain for several days; otherwise, the caustic material may be washed from the horns and into the eyes, which may be severely damaged. This method is seldom used with beef cattle, because calves are born in the pasture and run with their mothers, and its use would require frequent handling and close observation of the herd.

Mechanical dehorning may be accomplished by the use of hot irons, spoons and tubes, Barnes-type dehorners, clippers, saws or elastrators.

Calves past the button stage, up to 2 to 3 months of age, can be easily dehorned with hot irons--electric dehorners or heated irons. Select the size that fits the horns to be removed. Electric dehorners have an automatic control that maintains the temperature at about 1000° F. Apply the dehorner over the horn and hold it firmly against the head for about 10 seconds. The heat destroys the horn growth cells around the base, and the horn will usually slough off in about a month to 6 weeks. This is a fairly fast method of dehorning and is practically bloodless.

Spoons and tubes can also be used successfully on calves up to 2 or 3 months of age, because the horns are still more or less skin appendages and can be scooped out. Dehorning tubes are usually bought in sets of four, varying in size from 3/4 to 1-1/8 inches in diameter. Select the size that fits over the base of the horn and about 1/8 inch of skin around the horn. Place the cutting edge straight down over the horn. Push and twist until the skin has been cut through, then use the cutting edge of the tube to cut under the horn button area and lift it out.

Barnes-type dehorners, often called scoop dehorners, come in different sizes, and can be easily used on calves up to 4 to 5 months of age or even older. To use a Barnes-type dehorner, close the handles and fit the blades over the horn. Be sure the blades are correctly positioned to remove about a quarter inch ring of skin with the horn. Spread the handles apart quickly, closing the blades and thus removing the horn by the scooping action of the blades.

Dehorning clippers or saws are generally used for

dehorning older cattle. Clippers are usually preferred because they are easier to use, quicker, make a smoother cut, and cause less pain to the animal. Saws may have to be used on abnormally large horns on old cattle, for fear of clippers crushing or slivering the horns. Saws are slow and very painful to cattle. To use clippers, place the opened blades over the horn so as to remove about a quarter inch ring of skin with the horn. Quickly close the long handles, clipping off the horn.

When large animals are dehorned there may be excessive bleeding. If this occurs, you may pick up the main artery on the underside of the cut with forceps and pull it until it breaks. The broken artery goes back into the softer tissues and usually the bleeding stops.

Regardless of the kind of mechanical tools used in dehorning, you must remove a small ring of skin around the base of the horn which contains the skin cells from which horns grow. Otherwise, there will be a later growth of an abnormal, unsightly horn, commonly called a scur. Cattle must be held securely for the dehorning operation to be successful. Handle the animals in a chute with a head squeeze or snub them to a post if you have plenty of labor to hold them still.

If dehorning is done in cool weather when there are no flies, wound treatment usually is not necessary. If there is any doubt about the presence of flies, apply a fly repellent such as pine tar or Smear 62 to the wound.

Disinfect tools used for dehorning, except hot irons and electric dehorners, before and after each operation to prevent the spread of infections and contagious diseases. This step is especially important in areas where anaplasmosis is prevalent. Wash used instruments in cold water, then soak them in a disinfecting solution. A good disinfecting solution may be made by adding 4 ounces of cresol to 1 gallon of water.

Breeding horns off with polled bulls is the most humane method of producing hornless cattle. In other words, by using naturally polled bulls, the horns may be bred off of the calves. If a bull is pure for the polled condition, practically all of his calves will be polled even though their dams have horns. This method is a little less successful in cow herds that are high in Brahman breeding. This method saves labor

and avoids pain and possible setback to the calves. The breeding of polled calves is gaining in popularity with the increase in the availability of good polled bulls.

Question No. 229 List five reasons for castrating bull calves.

a. _____
b. _____
c. _____
d. _____
e. _____

Question No. 230 What is the most favorable age to castrate a calf, and what is the most preferred season for castration?

_____

Question No. 231 What are the three most common methods of castration, and how are they done?

a. _____

b. _____

c. _____

Question No. 232 Which of the three methods of castration is the most fool-proof? _____

Question No. 233 Which of the three methods of castrating has the least impact on the animal and results in the least setback to the calf? _____

Question No. 234 Why should cattle that are going into the feedlot be dehorned?

a. _____

b. _____

c. _____

Question No. 235 What are the arguments against dehorning?

a. _____

b. _____

c. _____

Question No. 236 What are the two generally used methods of dehorning?

a. _____

_____

b. _____

_____

Question No. 237 Young calves, up to about 10 days of age, may be dehorned by using what compounds? _____

_____

_____

Question No. 238 Why is this chemical seldom used for range cattle?

_____

_____

_____

Question NO. 239 What are three methods of dehorning calves that are commonly born in the pasture or rangeland?

a. _____

b. _____

c. _____

_____

Question No. 240 Spoons or tubes and scoop dehorners do what to the horn button? _____

_____

_____

_____

Question No. 241 How would older cattle be dehorned? _____

_____

_____

_____

_____

_____

Question No. 242 Should the dehorning instruments be disinfected after each use? _____

_____

_____

Facilitating Identification of Beef Cattle

The use of marks or markers to show ownership and for certain management purposes has been practiced since the earliest days of cattle raising in the United States. One of the primary purposes for identifying cattle has been to discourage thieves by the application of permanent marks that may be easily identified. Cattle are commonly marked for the following reasons:

1. Purebred registry associations usually require certain specific types of permanent identification as a prerequisite to registration.

2. To enable the owner to identify the animals that belong to him or her.

3. To denote age as an aid to culling.

4. To help keep detailed breeding records, especially in purebred herds, and for use in performance testing programs.

5. To serve as a means of establishing legal title.

The various methods of placing identifying marks or markers on livestock are discussed in the following sections:

Branding

Hide brands are made with branding irons that are fashioned into letters, characters, figures or combinations of these. Hide brands are usually permanent. Temporary paint brands are sometimes used in sale barns, or when treating large numbers of animals. A brand should be of simple design, yet it should be one that cannot be easily changed or tampered with. The brand should be large enough to be easily read at a distance of 30 to 40 feet. The object in branding is to burn, freeze, or sear the hide deep enough to destroy or change the hair follicles, but not deep enough to burn the flesh and cause a bad sore or wound. There are three methods of branding:

A. Hot-iron Branding. This is usually done with a long-handled branding iron that is heated in a wood fire. The iron should be heated to a light yellow glow so that by the time the iron is applied it will be ash gray. The color corresponds to temperatures that will not burn the cattle too deeply. Press the iron firmly against the skin for only a few seconds. If the hide surface is merely seared or scorched, the brand usually peels and remains distinct. Brands should be 3 to 4 inches high and have a face width of 1/8 to 1/2 inch.

B. Freeze Branding. This method employs a super-cooled branding iron. The method is fairly painless, permanent, and leaves no scars or thickened areas to discount hides. The area where the brand is to be applied is clipped, the surface is wet with alcohol, and a super-cold copper branding iron is applied. The iron is cooled in either dry ice and 95 percent denatured alcohol or in liquid nitrogen.

A 40-second application for calves and a 60-second application for mature animals for the dry ice and alcohol, with the iron at a -94^{o} F., will make a good brand. With liquid nitrogen, which has lower temperatures, the iron is applied for 10-15 seconds for calves and 20-30 seconds for mature animals.

The freezing destroys the pigment producers in the hair follicles, and the hair grows out white and remains white. For white-coated animals a longer application can be used to destroy the hair follicles, producing the same type of brand as a hot-iron brand except that the freeze brand is relatively painless and the hide damage is much less severe.

C. Liquid Branding. This method is accomplished by applying caustic branding fluid with a cold iron. This method is less widely used than the hot-iron method because the results are generally less satisfactory, particularly if the operator is inexperienced with the method. Best results are obtained if the area of the animal where the brand is to appear is first clipped. The branding iron is then dipped in about 1/8 inch of branding fluid that has been stirred thoroughly. The fluid tends to run if too much is used, and the hair is removed from every place that a drop of the fluid strikes. The brand may spread or blur if the surface is wet, or if the animal switches it with the tail before the fluid dries. Because liquid branding does not change the color of pigment nor change the direction of hair growth, this type of brand becomes illegible more quickly as hair grows out than is the case with a hot-iron brand.

Earmarking

Earmarking probably ranks second only to branding in its extensive use. The method is used mainly with range cattle. Earmarks leave permanent identifying marks that will not be lost easily. In some States, earmarks can be registered just as brands are. Earmarking has the advantage of not damaging the hides, unlike branding. Earmarking also enables you to identify cattle from the direct front or rear, and this may have merit because it is often impossible to get a side view of wild cattle in a pasture. Because earmarking disfigures the cattle, earmarks are not popular in most areas. Marking is done in calfhood by cropping, slitting, or notching the ears, with either a sharp knife or a regular ear notcher. The method is generally used to supplement branding to indicate ownership. For example, earmarks may be used to quickly identify cattle when separating animals of several herds whose brands are not easily visible. Some of the more common earmarks are shown in figure 4.

Figure 4.--Nine common earmarks of cattle.

Earmarks have two main disadvantages. They can be altered easier than brands and the ears may get torn, creating a new marking.

Tattooing

Tattooing the ears of cattle is a permanent method of identification that has usually been adapted for use in purebred herds of most beef breeds. A tattoo is usually used to identify individual cattle for purposes other than to establish ownership.

Tattoos are sometimes used in commercial herds as a more permanent method of identification than cutting the ears, and they do not disfigure the animal. The one serious disadvantage is that the animal must be caught and the ear closely examined before the tattoo can be read.

A tattoo outfit consists of either tattoo pliers with replaceable digits or a rotary tattoo instrument, plus alcohol, cotton, and a bottle of indelible ink.

The tattooing is done with the special tattoo instrument (figure 5) that places the digits, letters, or characters under the skin of the ear by means of several needlelike points dipped in a special indelible ink before application. The grease and dirt should be cleaned out of the ear with alcohol and cotton. The area selected to be tattooed should be free of pigment, between the cords or ribs of the ear, and near the base of the ear. To make sure you have the correct digits you should clamp a piece of cardboard to be sure that the figures or letters are in the order desired and right side up. The instrument is then dipped into the ink and clamped quickly and firmly into the tattoo area of the ear. This step is followed by rubbing additional ink into the freshly pierced area and into the perforation

marks until each separate puncture hole is well filled. The secret of the procedure is to get the ink in below the surface so that skin will heal over it.

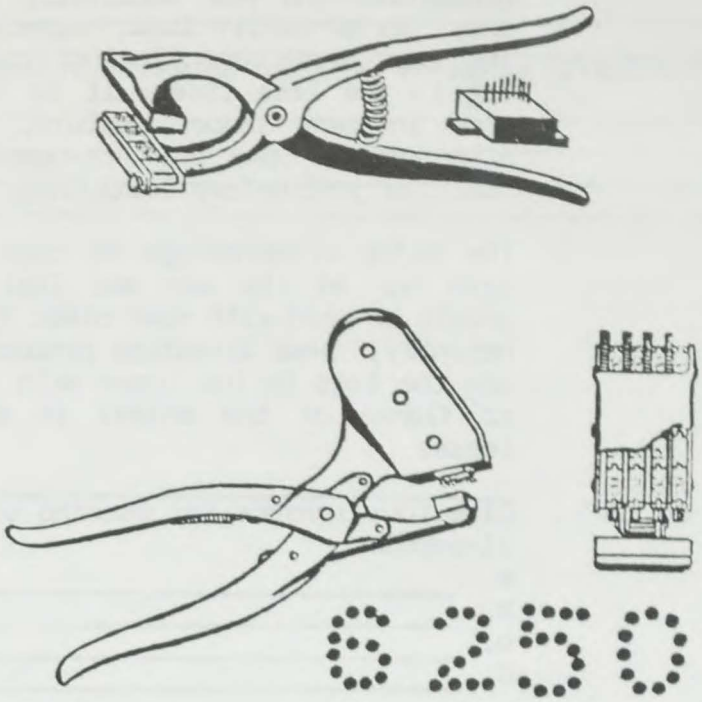

Figure 5.--Tattooing instruments

Neck Chains

Neck chains with number plates are often used with purebreds, especially with Angus, Polled Hereford and Polled Shorthorn cattle. The standard neck chain is a 40-inch, case-hardened steel chain with plates that are from 3-1/2 to 4 inches. The plates are made from materials such as brass, aluminum, nylon or plastic. The identification numbers or letters are stamped, embossed or painted on the plates. The big disadvantage to neck chains is that the chains have to be constantly adjusted as the cattle grow older. On brushy range they are often lost, as they get tangled in the brush.

Ear Tags

Ear tags are perhaps the fastest growing method of identification. They are not used as much to establish ownership as they are to identifiy an individual animal. They are used mostly by livestock producers who keep records on individual animals for purposes of breeding, culling, selection and keeping track of numbers allowed in an area.

The Forest Service uses the tags to identify the permitted livestock by owner, allotment and number of permitted livestock. The tags are clamped on the ear or inserted through the ear. Depending on tag properties and how skillfully the tags are put on, they can be easily lost, especially in brushy areas. The tag makers are finding that the more flexible a tag is the less likely it is to be lost. The tags come in many shapes, colors, sizes and methods of attachment. Some are pre-numbered and some can be numbered just before installing.

The major disadvantage of tags is that they may be torn out of the ear and lost. Consequently, they should be used with some other type of identification. Recently, some livestock producers have been installing the tags in the loose skin of the brisket, dewlap or flanks of the animal in an effort to minimize losses.

Question No. 243 Give four reasons for marking or attaching markers to livestock.

a. _____
b. _____
c. _____
d. _____

Question No. 244 What are the five methods used to aid in identification of cattle?

a. _____
b. _____
c. _____
d. _____
e. _____

Question No. 245 What three methods to identify livestock are most commonly used among range cattle?

a. _____
b. _____
c. _____

Question No. 246 What are the two most commonly used methods of branding?

a. _____
b. _____

Question No. 247 Which method of branding is usually most satisfactory?

_____
_____

Question No. 248 What are some disadvantages of earmarking as opposed to branding? _____
_____

Question No. 249 Why is tattooing not commonly used for range livestock?

Question No. 250 Why are neck chains not used on range livestock?

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APPENDICES

APPENDIX I.--GLOSSARY OF BEEF CATTLE TERMS

BABY BEEF--Young slaughter cattle, steers or heifers, usually from 8 to 18 months of age, weighing from 600 to 1,200 pounds.

BALANCED RATION--A ration which provides all the required nutrients in proportionate amounts daily.

BLOOM--A shiny hair coat and high degree of finish usually associated with milk-fat calves.

BOLOGNA BULLS--Old bulls not suitable for retail sale over the butcher's block, commonly used in making bologna sausage.

BRAND--A permanent identification mark caused by burning a letter, character, or figure into the hide of cattle with a branding iron.

BREED--A group of cattle having certain distinguishing characteristics (color markings, size, shape, etc.) not common to other cattle. These characteristics are usually transmitted uniformly from parents to offspring.

BREEDER OF AN ANIMAL--The owner of the dam at the time she is bred.

BREEDING HERD--The livestock retained for breeding purposes to perpetuate the herd or band. Excludes animals being prepared for market.

BROWSE--That part of leaf and twig growth of shrubs, woody vines and trees available for animal consumption. To consume browse.

BROWSE-LINE--A well-defined height to which browse has been removed by animals.

BULL--A male animal.

CALF CROP--The number of calves weaned from a given number of cows bred, usually expressed in percent.

CALVES--Generally, animals under 12 months of age.

CANNERS--A market grade of slaughter cattle. Usually old cows not fat enough for fresh beef trade and therefore must be canned.

CARBOHYDRATES--Feed nutrients which produce fat, heat and energy. Feeds containing large quantities of starch and sugar are rich in carbohydrates. Most farm grains are rich in carbohydrates.

CASTRATE--To remove the testicles of a male animal.

CHOICE--A market grade of cattle. It is next to the top grade and includes only very high quality animals and highly finished animals.

COMMON--A market grade of stocker and feeder cattle. The cattle are of poor quality.

CORRAL--A pen or enclosure for holding or confining cattle.

CONCENTRATES--Feeds that supply a large quantity of nutrients per unit of weight. They include grains, oil-seed meals and by products of the grain milling industry.

CONDEMNED--Pronounced by inspectors as unfit for human consumption.

CREEP FEEDING--Supplemental feeding of suckling livestock in such a

manner that the feed is not available to the mothers or other mature livestock.

CROSSBRED--An animal resulting from the mating of purebred animals of two different breeds.

CRIP--On the market, an animal that is unable to walk over the scales is called a crip and is the seller's loss. If the animal is injured after weighing the loss is usually the buyer's.

CULL--A market grade of slaughter calves--very low quality. The term is also used to designate animals removed from a breeding herd because of inferiority, disease, or injury.

CUTTER--A market grade of slaughter cattle. These cattle are a little better than canners because part of the carcass may be used in the fresh beef trade while the balance is canned.

DAM--The female parent.

DEHORNED--The horns have been removed.

DIPPING--Immersing animals in a specific solution to control insects or disease.

DIRECT--Cattle purchased on the farm or ranch and shipped direct to slaughter.

DRESSING PERCENTAGE--The weight of the chilled carcass divided by the weight of the live animal. Yield and dressing percentage are often used interchangeably.

DRENCHING--A forced dose of a specific solution given orally to an animal, usually to control internal parasites.

FANCY--The top market grade of stocker and feeder cattle. This grade corresponds to the prime grade of slaughter cattle.

FAT--A feed nutrient that produces energy and fat in the body. Fats produce 2-1/4 times as much energy as carbohydrates. Oil seed meals are rich in fats.

FEEDERS--A classification of cattle based on their use. The term refers to cattle with sufficient growth, but usually not fat, for placing immediately in feed lots for finishing.

FILL--The feed and water given to cattle before they are weighed for the buyer.

FINISH--The degree of fatness.

FORAGE--All browse and herbaceous foods that are available to grazing animals. Forage may be grazed or harvested for feeding. Act of consuming forage.

FORB--Any herbaceous plant other than those in the Gramineae, Cyperaceae and Juncacea families (grasses, grasslike plants, sedges and rushes).

FOREQUARTERS--The shoulders of an animal, or the front half of a carcass.

FREEMARTIN--A heifer born twin with a bull, usually barren.

GESTATION PERIOD--The length of time between conception and birth, usually 283 days for beef calves.

GOOD--A market grade of cattle of fairly good conformation, quality and finish.

GRADE--Grade cattle show characteristics of some of the beef breeds, but are not registered. They usually are a result of breeding purebred

beef breed bulls to cows of mixed breeding to improve the conformation of the offspring of the cows.

GRADE--As used on the market, refers to an animal's relative excellence and desirability for its particular use. The U.S. Department of Agriculture has developed official standards for the various market grades of cattle. The market grades of slaughter cattle are based on: (1) conformation, (2) finish, (3) quality and (4) maturity or age.

GRASS CATTLE OR GRASSERS--Cattle that are marketed directly from the pasture without receiving any additional feed.

HEIFER--A young female before she has her first calf.

LONG-FED CATTLE--Cattle that have been on feed longer than 6 months.

LONG YEARLINGS--Cattle between 18 and 24 months of age.

MARGIN--The difference between the cost per hundred pounds of feeder cattle and the selling price of the same animals as fat cattle.

MARKET CLASS--A market division of cattle based on sex--steers, cows, heifers, bulls and stags.

MARSH--Flat, wet, treeless areas usually covered by standing water and supporting a native growth of grasses and grasslike plants.

MEDIUM--A market grade of stocker and feeder cattle. The name is descriptive of the cattle.

MULEY CATTLE--Refers to polled cattle--naturally without horns.

NURSE COW--A cow used to furnish milk to calves that are not their own. Commonly used by purebred breeders, particularly with show cattle.

PEDIGREE--The record of an animal's ancestry.

PLAIN CATTLE OR COMMON CATTLE--Usually refers to cattle of nondescript breeding lacking in beef type of conformation.

POLLED--Polled cattle are naturally hornless.

PREPOTENT--The ability to transmit characteristics to offspring to an unusual degree.

PRIME--The top market grade of slaughter steers and heifers and their carcasses, indicating a very high degree of finish, conformation, and quality.

PROTEIN--The feed nutrient that produces growth, particularly muscular development, and makes tissue repairs in the body. Oilseed meals are rich in protein.

PUREBRED--An animal whose sire and dam are registered. The term is usually synonomous with registered or full-blooded.

RANGY--A long-bodied and long-legged animal.

RATION--The amount of feed given an animal in a 24-hour period.

REGISTERED--An animal that is recorded in the breed association official registry. Registration is a record of ancestry and is a source of information for pedigrees.

ROUGHAGES--Feeds that are coarse and bulky such as hay, straw and silage.

SCURS--Ill-formed, stubby growths of horns that may develop in some polled animals or in animals that were improperly dehorned.

SHRINK--Usually refers to loss in weight from the farm to the market.

SHORT-FED CATTLE--Cattle on feed from 2 to 4 months.

SHORT YEARLING--Cattle between 12 and 18 months of age.

SIRE--The male parent, or bull.

SPRINGER--A cow due to calve in a short time.

STAG--An unsexed male that was not castrated until advanced in age. One which has a heavy development of the head, neck and forequarters.

STEER--An unsexed male that was castrated before secondary sexual characteristics developed--usually before 6 months of age.

STOCKERS--A classification of cattle based on their use. Usually, cattle that are not to be finished in the feed lot immediately, but are to be handled in a way that obtains maximum growth at the lowest possible feed cost. These cattle usually are kept on pastures and roughages. Stocker cattle may be calves, cows, steers or bulls. They are usually in thin condition and can use grass and other roughages to advantage.

TAG--A label attached, usually to the ears of animals, for identification.

TYPE--Beef type refers to the conformation of the body. The body is blocky, somewhat rectangular, heavily muscled and on short legs squarely placed on the corners of the body. The animal is particularly adapted for the purpose of producing beef.

WALKWAY--An earthen embankment constructed to improve the accessibility of marsh range.

YEARLING--Cattle between 1 and 2 years old.

YIELD--See "Dressing Percentage."

APPENDIX II.--ANSWER SHEET

Number

1. a. Bos taurus primigenius (Giant ox) (4) Shorthorn, (5) Aberdeen Angus.
   b. Bos taurus longifrons (Celtic ox) (3) Jersey.
   c. Bos taurus brachycephalus (2) Hereford.
   d. Bos taurus frontosus (1) Simmental.
   e. Bos indicus (6) Brahman.

2. The first cattle to reach the Western hemisphere were brought in 1000 by the Norsemen.

3. The first grazing policy was approved in 1950.

4. 1. An inventory of the forage resources and allotment characteristics.
   2. Management of the Range Resource.
   3. All grazing will be by permit.
   4. Cooperation with permittees.
   5. Control of unauthorized use and trespass.
   6. Use qualified people.

5. Beef cattle numbers increased about 278 percent as against 259 percent for the entire United States.

Number

6.

1.	Cereals	Generally down
2.	Pork	Relatively stable
3.	Vegetables	Down then up
4.	Fruits	Down then up
5.	Beef	Generally up
6.	Fish	Generally up
7.	Lamb and mutton	Down
8.	Chicken	Up
9.	Potatoes	Down

7. There has been a continuing improvement in milk production per cow which has more than offset the decline in milk cow numbers.

8. In general, high prices cause everyone to hold back more cows to produce more calves until production is too high. When production is too high, the bottom drops out of the market and then producers try to reduce their herd. In effect, high prices cause increases in herds and low prices cause decreases in herds.

9. The higher per capita income, the higher the consumption of beef.

10.
a. County buyers or cattle dealers
b. Auction markets
c. Packing plants
d. Central markets
e. Telephone auctions

11.
a. Love for beef cattle
b. Land
c. Labor
d. Capitol
e. Buildings and equipment
f. Feed supply
g. Market outlets

12.
a. To breed superior animals for foundation stock for other purebred breeders.
b. Produce good, purebred bulls for commercial cow-calf operators, and females for beginning purebred breeders.

13. Yes. This is an item of expense that is often overlooked and can cause heavy losses if it is not considered and used.

14.
a. Annual production sales
b. Catalogs
c. Livestock shows
d. Livestock journals
e. Magazines
f. Highway billboards

15. The commercial cow-calf program is especially adaptable to regions where pasture is plentiful and land is relatively cheap. Most of the area used for cow-calf operations is unsuitable for row-crop farming, but will produce good pastures.

Number

16. The possibility for profit depends almost entirely on the sale of calves. There is some income from the sale of culled cows, but it is not very much. The calves must pay all of the operating expenses of the cow-calf program.

17. The best program would probably be a finishing or fattening program that would make the most efficient use of the grains produced.

18. The commercial cow-calf program possibly would be the best answer as it is not labor intensive and could use the rough land.

19. Only young cattle, calves and yearlings. These cattle are growing, and the weight gains through normal development are your source of profit.

20. An animal with mixed characteristics of the dairy and beef types. The dual-purpose type is not as lean, angular and upstanding as the dairy type, but not as blocky, thick, and as low set as the beef type.

21. Some of the inherited traits are:
    a. Color
    b. Horns
    c. Milk production
    d. No horns
    e. Disease resistance
    f. Size
    g. Weaning weight

22. The native home of the Aberdeen Angus is northeastern Scotland.

23. a. Compact
    b. Good grazer
    c. Smoothness
    d. Symmetry
    e. Early maturing
    f. High quality carcass
    g. Naturally polled

24. Yes.

25. O. A legitimate claim for the Aberdeen Angus breed is that the bull will dehorn one hundred percent of his calf crop.

26. Pink eye and cancer eye.

27. a. Tendency to be a bit excitable and wild.
    b. Small size.
    c. Bulls not trailing cows in heat as closely as other breeds.

28. a. The Hereford breed is the most popular breed in range country because it is a good forager and can withstand the rigorous conditions.
    b. The native home of this breed is Herefordshire, England.

Number

29. Poor; a longer and more curly coat of hair than most other breeds, a thicker hide than Shorthorn or Aberdeen Angus.

30. Milking capacity or good flow of milk; acceptable carcass.

31. The milking capacity may account for the use of shorthorn bulls in cross-breeding.

32. a. Not as good grazers.
b. Not as good rustlers.

33. The first Brahman foundation stock was imported into South Carolina in 1849 from India.

34. Southern Texas became the chief center of Brahman cattle in the United States.

35. a. Tough hides
b. Short hair
c. Produces an oily secretion of the skin which causes an odor or tastes offensive to insects and pests.

36. a. Good grazers
b. Regular breeders
c. Endurance of hot climate
d. Hardy
e. Resistance to insects and pests
f. Rapid development of calves
g. Carcass quality
h. Milking ability

37. a. Milking ability
b. Rapid development of calves
c. Heat tolerance
d. Insect and pest resistance
e. Grazing ability
f. Carcass quality

38. a. Lack of body width
b. Uneven lines
c. Drooping rump
d. Excess length of leg
e. Excessive hide in the dewlap and sheath
f. Tendency toward wild dispositions

39. The Santa Gertrudis breed of beef cattle was developed on the King Ranch of Kingsville, Texas.

40. a. Shorthorn cows
b. Brahman bulls

41. a. Five-eighths Shorthorn blood
b. Three-eighths Brahman blood

42. a. Subtropical climate
b. Semi-arid ranching conditions

Number

43.
a. Large gains on grass
b. Good rustler
c. Rapid development
d. Rapid rate of gain

44.
a. Brahman bulls — Proportion: three-eighths
b. Aberdeen Angus cows — Proportion: five-eighths

45.
a. Good grazers
b. Disease and insect resistant
c. Good quality beef
d. Large size and high dressing percentage.

46.
a. (1) Angus
b. (4) Hereford
c. (6) Africander
d. (8) Santa Gertrudis

47.
a. Hard feet
b. Sound legs
c. Good milking ability
d. High browse utilization
e. Wild type grazing
f. Small calf at birth
g. Heat tolerance
h. Close sheath
i. Good depth of body
j. Heavy hindquarters
k. Range ability
l. Width of pelvis
m. Marbling factor

48.
a. Aberdeen Angus
b. Barzona
c. Beefmaster
d. Brahman
e. Brangus
f. Charolais
g. Charbray
h. Devon
i. Galloway
j. Hereford
k. Milking Shorthorn
l. Polled Hereford
m. Polled Shorthorn
n. Red Angus
o. Red Poll
p. Santa Gertrudis
q. Scotch Highland
r. Shorthorn

49.
a. Characteristics of the breed
b. Prominence of the breed in the area
c. Personal preference
d. Environmental conditions under which the animals will be raised.

50. The ability to judge, or select beef cattle is one of the most essential and constantly used talents of the beef cattle producer.

51.
a. The old time method deals with selection on the basis of type, or body conformation.
b. Present-day methods include selection on basis of type and on performance records, or "doing ability," as determined by the daily gain.

52.
a. Dressing percentage
b. Area of loin eye
c. Birth weight
d. Feedlot gain

Number

53. Birth weights of calves usually increase with the age of the cow up to about 5 or 6 years of age.

54. True. The weaning weight of a cow's first calf could serve as a reliable guide in selecting replacement stock.

55. None.

56. In recent years the appearance of dwarfism, particularly in the Hereford and Aberdeen Angus breeds, has caused alarm as well as considerable financial loss among purebred breeders.

57.
a. Fancy
b. Choice
c. Good
d. Medium
e. Common
f. Inferior

58. 50 percent by the bull and 50 percent by the cow.

59. Because a bull can have 25 to 40 or more offspring in a year and many more during his lifetime than a cow.

60. At least 3 to 5 times the value of a cow.

61. To raise and wean a good, heavy calf every year.

62. They reach sexual maturity and produce viable sperm before they are 1 year old. They should never be used for breeding purposes under about 15 months of age.

63. Mature at 3 or 4 years, up to about 8 years of age.

64. The same bull should not be kept in the same herd much more than 2 years, or else he will be mating with his daughters, which is generally undesirable.

65.
a. Purebreeding
b. Inbreeding
c. Linebreeding
d. Outcrossing
e. Crossbreeding
f. Upgrading

66. a. Crossbreeding b. Upgrading

67.
a. Increase in rate of growth.
b. Efficiency of production
c. Strengthening of desirable traits of both parents.
d. Recession of undesirable traits.

68. The lack of desirable replacement heifers over a period of years. The heifers, if used, would lack uniformity in size, color, and conformation.

Number

69. Purebred sires of any pure beef breed are mated to native, nondescript grade cows.

70. The purposes are to develop uniformity, improve quality, and increase performance in the offspring.

71. The greatest progress is made in the first cross because 50 percent of the inheritance of the offspring comes from the bull.

72. a. First cross - purebred bull - native cow 50 percent.
b. Second cross - second purebred bull - first offspring (1/2 of 50), (50 + 25) 75 percent.
c. Third cross - third purebred - second offspring (1/2 of 25), (75 + 12-1/2) 87-1/2 percent.
d. Fourth cross - fourth purebred bull - third offspring (1/2 of 12-1/2), (87-1/2 + 6-1/4) 93-3/4 percent.

This plan would take about 8 years to complete, assuming you keep each purebred bull for 2 years, and do not breed any bull to its daughter, which could cause a regression of desirable traits.

73. Daily gain of Aberdeen Angus 1.28 pounds, and the daily gain of Brahman X Angus 1.70 pounds.

74. The daily gain on feed of the Aberdeen Angus was 1.19 pounds and the daily gain on feed of the Brahman X Angus was 1.27 pounds.

75. Heifers usually reach sexual maturity at about 1 year of age.

76. A heifer should be at least 15 months of age and should weigh from 700 pounds to 800 pounds before being bred.

77. The main disadvantage of breeding heifers to calve at 2 years of age is that they often require assistance at calving time.

78. The 2 year olds had a cost of $10.02 as opposed to 3 year olds of $11.73, or $4,779.54 versus $5,712.52, a difference of $932.98.

79. The gestation period of beef cows runs from about 270 to 290 days, with an average of 283 days.

80. They should be bred about the first of May 1982 (16 months), and they would be expected to calve about the first week in February 1983 (9 months).

81. The annual cost varies from $150 to $250, with the average at about $200.

82. The cost usually runs about $1 to $2 per head.

Number

83. It would cost between $3,000 to $5,000 to carry the 20 barren cows for the whole year and between $100 and $200 to have the entire herd pregnancy-tested.

84. The percent calf crop and the weaning weight per calf.

85. $223.12 (350 x $0.85 = $297.50, $297.50 x 75% = $223.12)

86. $344.25 (450 x $0.85 = $382.50, $382.50 x 90% = $344.25)

87. 235 pounds ($200 - $.85 = 235)

88. 27% (90% - 63% = 27%); 17% (90% - 73% = 17%)

89. A bull can service about 25 to 30 cows under the pasture method of mating.

90. No. It would seem that in very small cow herds of 10-15 cows the pro rata annual bull cost per calf would be so great that there would be no reasonable hope for profit.

91. Beef cattle usually stay in the pasture or on the range and are seldom housed or handled. Also, the methods of heat detection were very poor. With improved heat detection methods and portable pens this has changed.

92. a. Protein
b. Energy (carbohydrates and fats)
c. Minerals
d. Vitamins
e. Water

93. The protein is needed to build muscles, internal organs, cartilage, connective tissues, skin, hair, horns and hoofs. In mature animals, protein is only needed to maintain the daily breakdown of these parts.

94. a. Fats b. Carbohydrates

95. Because roughages are so bulky, and incompletely digested, cattle can't consume enough to produce the weight required to finish for market.

96. a. Total digestible nutrients (TDN) b. Digestible energy (DE)

97. Common salt

98. a. Calcium b. Phosphorus

99. In a mineral self-feeder with steamed bone meal, or defluorinated rock phosphate, or di-calcium phosphate.

Number

100. The normal requirement of salt by cattle is from 1.5 pounds to 3 pounds per month per head. About twice this amount should be made available.

101. Vitamin A.

102. During long feeding periods where nothing but weathered, poor quality roughage was fed. By providing some good quality green, leafy hay or good quality silage. You can also supply a vitamin A supplement.

103. Water. Mature beef cattle need an average of about 12 gallons of water per head daily.

104. Spread of several dreaded diseases, including leptospirosis.

105. a. Corn (yellow dent #2), 6.7 percent protein, 81 percent TDN
b. Molasses (cane), 3.2 percent protein, 54 percent TDN
c. Sorghum (grain), 11.1 percent protein, 74 percent TDN
d. Cottenseed meal, 41 percent protein, 78 percent TDN
e. Linseed meal, 30.9 percent protein, 69 percent TDN
f. Soybean meal, 43.8 percent protein, 77 percent TDN

106. About 1 to 1-1/2 pounds per cow per day.

107. Almost all woodland range forage, and most unfertilized native pasture forage in the South, is seriously deficient in nutrients during the fall and winter months.

108. a. Various grains
b. Wheat bran
c. Cottonseed meal or cake
d. Linseed meal
e. Soybean meal
f. Steamed bonemeal
g. Hay
h. Silage

109. a. On pasture b. In a dry feed lot

110. a. corn
b. oats
c. grain sorghum
d. barley
e. wheat
f. rye
g. citrus pulp
h. beet pulp
i. molasses
j. hominy feed

111. a. Cottonseed meal, b. soybean meal, c. linseed meal.

112. Urea is a nitrogenous, nonprotein compound that ruminants can convert into protein.

113. The conversion of urea into protein is effective only when urea is added to a concentrate mixture, such as cereal grains, which supply plenty of energy.

Number

114. The bacterial action in the paunch converts the nitrogen into protein and when the bacteria die and are digested the protein becomes available to the animal.

115. Molasses is a nonprotein, high carbohydrate feed.

116. Molasses added to poor quality roughage in limited amounts increases the consumption of the roughage and provides additional carbohydrates. It makes the roughage more palatable.

117. Fattening rations cannot be made up of a high percentage of roughage because most common roughages are low in digestible energy, total digestible nutrients and crude protein, and may be high in fiber content. Exceptions are high quality roughages such as alfalfa hay and high quality silage.

118. a. They furnish part of the required feed nutrients at the cheapest cost.
b. They furnish bulk to the ration which is absolutely necessary in the process of rumination.
c. High quality roughages are a good source of needed minerals and vitamins. Low quality feeds may also have needed minerals and vitamins.

119. One of the main reasons for carrying on a beef cattle operation of any type is to use the supply of roughage on the farm.

120. The National Forest range serves as a source of roughage for the livestock.

121. a. antibiotics
b. hormones
c. mineral supplements

122. The hormones improve the rate of gain and also improve the efficiency of gain.

123. Hormones produce results through physiological stimulation rather than the rough normal nutritional channels.

124. a. salt (sodium chloride)
b. calcium
c. phosphorus
d. potassium (trace mineral)
e. iodine (trace mineral)
f. cobalt (trace mineral)
g. manganese (trace mineral)
h. iron (trace mineral)
i. zinc (trace mineral)
j. copper (trace mineral)

Trace minerals in too heavy a concentration can cause disease symptoms and even death.

125. a. As a disease control
b. As a disease preventor
c. As a growth stimulant

Number

126. Beef cattle are out in the open most of the time and get more fresh air and sunshine.

127. One billion dollars.

128. The specific cause of anthrax is Bacillus anthracis, a spore forming, rectangular-shaped bacteria of relatively large size.

129. Yes. Anthrax occurs in all parts of the world, but repeated outbreaks usually occur in certain areas. One of these areas is the South.

130. Yes. The disease may be contracted by humans through handling infected animals or carcasses.

131. Spores are usually the source of infection. Animals become infected through food, water, openings in the skin, bites of infected insects, and even by breathing. Spores retain their viability for many years in the soil, water or any contaminated object.

132. Death is often very sudden and may be the first indication. There may be staggering, difficult breathing, trembling, collapse, convulsions, and death.

133. The control of anthrax depends primarily on prevention, because once a pasture or premises becomes infected the infection will remain for many years. Annual vaccination of all livestock early every spring is the most effective method of prevention.

134. Use of sanitary instruments and control of blood-sucking insects.

135. Yes. It is especially prevalent in the Southeastern, Gulf, and Southwestern States.

136. During the summer months. It is usually spread by blood-sucking insects such as mosquitoes, horse flies, horn flies, ticks and by such operations as dehorning, castrating, and vaccinating.

137. Anaplasmosis is caused by microscopic protozoan parasites.

138. It is infectious and transmissible.

139
a. anemia
b. jaundice
c. fever
d. loss of condition
e. increased pulse and breathing
f. pale mucous membranes of the lips, nostrils, and mouth lining

140. No. Animals that recover from the active disease are carriers and can spread the disease.

Number

141. No. The vaccine will not always prevent cattle from getting anaplasmosis, but it will reduce weight losses and deaths.

142. a. By sterilizing tools and equipment used in dehorning, castrating and vaccinating.
b. By installing a good insect control program.

143. The disease primarily affects cattle under 2 years of age.

144. Blackleg is caused by Clostridium chauvoei, which is a rod-shaped, gas producing micro-organism.

145. High fever, lameness, loss of appetite, rapid breathing, and swelling of the large muscles.

146. Large doses of penicillin and blackleg antiserum.

147. No. The disease is highly fatal because difficulty of the of recognizing the disease in its earliest stages.

148. Blackleg can be prevented by vaccination.

149. Bloat is a digestive disorder, rather than a disease.

150. It is through some dysfunction of the belching mechanism. When a cow stops belching, the gas pressure builds up. Bloat is usually associated with grazing lush clover pastures.

151. A pronounced swelling of the left flank or both flanks.

152. Feeding a specially prepared penicillin-salt mixture. Feeding a new drug, Poloxalene, offers considerable promise.

153. a. Bang's disease b. Contagious abortion

154. Undulant fever in humans may be contracted from handling infected animals or drinking raw milk from infected cows.

155. Brucellosis is caused by one or more bacteria, or infectious organisms: Brucella abortus, B. suis, B. melitensis.

156. Infection takes place mainly through the digestive system from contaminated forage or contaminated water.

157. The predominant symptom in pregnant cows is abortion.

158. By blood testing individual animals.

159. Sell all infected cattle for slaughter. Once an animal is infected it usually remains infected for life.

Number

160. By vaccination, by employing the basic principles of sanitation and good herd management.

161. Cancer eye is a malignant tumor on the eyeball or eyelid of cattle.

162. Surveys show that about 90 percent of all cattle affected are of the Hereford breed.

163. Apparently the lack of pigment or color in the eyelid and eyelashes to shield the eye from intense sunlight contributes to the incidence of the disease.

164. Lesions or ulcers which gradually grow larger, appear on the eyeballs or eyelids of affected animals.

165. Usually the animal is sold for slaughter. Treatment by surgery is used only on very valuable, purebred animals.

166. The cause of foot rot is the micro-organism Sphaerophous mecrophorous.

167. The first signs of foot rot are varying degrees of lameness, from barely noticable in one foot to an extensive condition where a number of calves are affected.

168. Individual medication along with removing the sharp object, removing the affected tissues, moving the animal to a clean, dry place, and trim the hoof if necessary.

169. The disease may be transmitted directly by droplets of infective urine or indirectly by means of contaminated surface water. Probably also by breeding and artifical insemination.

170. By splashing urine, and drinking or eating contaminated food and water.

171. Abortion is common and takes place 2 to 5 weeks after the initial infection.

172. The only positive diagnosis is by blood test.

173. Cattle frequently pick up during eating or through curiosity, nails, staples, pieces of baling wire, and other metalic objects.

174. No. In many instances there are no visible symptoms; cattle die without any apparent cause.

175. No. Generally, treatment does no good.

Number

176. a. Not permitting metal objects to be where cattle have access to them.
b. Be sure the mineral requirements of cattle are included in the feed ration.

177. It accounts for high death losses, particularly in calves and young cattle.

178. Yes. Shipping fever is a highly infectious disease.

179. Those that create stress. The conditions that cause stress are: weaning, changes in environmental conditions, improper handling, excitement, exhaustion, irregular feeding and watering, branding, overcrowding, irritation of the respiratory tract, and exposure to disease organisms.

180. Coughing.

181. The disease is most common in calves and young cattle.

182. Because beef cattle are out in the open and are not confined in barns where the organisms are more prevalent.

183. No. Common scours is usually caused by overfeeding of milk, and beef cows usually don't give much milk.

184. Because of the tuberculosis eradication campaign many years ago. Every State in the United States has been tuberculosis-free for 20 years or more.

185. Reproductive organs of mature cattle.

186. It causes delayed breeding, infertility, and abortion.

187. The disease is transmitted primarily by carrier bulls.

188. No. The practical approach would be to replace the breeding herd in an orderly manner as soon as possible.

189. Purchase or obtain breeding animals that have been tested and proven vibriosis-free. Maintain a clean herd.

190. a. Tuberculosis
b. Leptospirosis
c. Undulant fever (brucellosis)
d. Anthrax
Not mentioned in text are also rabies and lumpy jaw.

191. A parasite is an organism that lives in or on another organism, known as the host, for the purpose of obtaining food and shelter.

Number

192. They spread and transmit such diseases as anaplasmosis and pinkeye from affected to susceptible cattle.

193. They bore into the lining of the stomach, intestines, lungs and liver, and live on the internal organs. This activity causes small hemorrhages and formation of nodules.

194. Infested cattle would show weakness, loss of condition, unthriftiness, anemia, diarrhea, and lack of coordination.

195. Yes.

196. Cattle from dry climates are very susceptible to worm infestation, have low resistance and often die from the sudden invasion of worms that are present in the South. Treat these cattle before turning them out, and keep a close watch to avoid large losses.

197. The parasites lay eggs that are passed from the body of the infested animal in the feces and urine where they hatch into the larval stage. The infective larvae are picked up by grazing animals and are ingested with the contaminated food.

198. They must have favorable conditions of warmth and moisture.

199. a. Have well drained pastures.
b. Prevent grazing along the shallow edges of ponds and streams.
c. Rotate pastures. The larvae will be killed by environmental conditions in the absence of susceptible cattle.

200. a. As a mixture with salt, and fed free choice.
b. As a mixture with minerals, and fed free choice.
c. As a drench, with about 20 to 60 grams per 100 pounds of body weight. The lighter dose of 20 grams is a preventive, and control with the heavier doses for heavier infestations.

201. The eggs hatch out in the lungs and the first-stage larvae are coughed up and swallowed. The larvae are then passed out in the feces. After a period of development they inhabit the vegetation, and are ingested when the animal is grazing, and the cycle starts again.

202. Yes. Aside from the fact that a sick animal may be physically dangerous, the animal with a light infection may pass several million larvae in its feces which, in turn, may infect many other animals and cause great losses.

203. Cattle producers can detect symptoms indicating lungworm infection, but the only way a sure diagnosis can be made is finding larvae in the manure by a microscopic examination.

Number

204. The first noticeable symptom is a cough, and breathing is difficult. Often a loud grunt follows each breath.

205. No. Because the range cattle are out roaming over wide areas exposed to fresh air and sunshine, and not concentrated where the disease can be as readily transmitted.

206. Good management practices, such as pasture rotation, well drained pastures, and dry feed lots or barns.

207. a. Insects, which are organisms provided with three pairs of jointed legs and either winged or wingless.
b. Arachnid, which is a spider-like organism that has four pairs of jointed legs.

208. During the summer months.

209. They appear in large numbers and their constant attack prevents the animals from feeding properly, thereby causing reduced gains in body weight.

210. Horn flies are about one-half the size of house flies, which are about 1/2 inch long.

211. Self treating devices such as back rubbers and face dust bags.

212. Wrap burlap or burlap sacks around a cable, chain or wire with ties of soft wire. Then saturate the burlap with an insecticide and suspend it between posts or in a gate opening, or around a waterhole or feed trough. Place the devices so that the cattle will go under them and rub against them.

213. Cattle grubs are the larval stage of the heel fly.

214. Evidence of cattle grub infestation are warbles, or grubs, which appear beneath the skin on the backs of cattle, usually during November, December and January.

215. a. Back spray
b. Dipping
c. Feed additives
d. Pour on
e. Oral-capsule
f. Oral-drench
g. Intra-muscular injection

216. They are the larval, or maggot stage, of the screwworm fly.

217. Male screwworm flies are raised, sterilized by irradiation, and then released to mate with wild female screwworm flies. The female screwworm fly mates only once and, when mated with one of the released sterile flies, does not reproduce. Remarkable control results have been obtained within a very short time.

Number

218. a. Blood sucking lice
b. Cattle biting lice
c. The blood sucking lice are the most damaging and can cause death.

219. The cattle appear weak and have extremely pale skin around the eyes, muzzle and udder. They will probably be rubbing or scratching against some object.

220. Calves, yearlings and old, undernourished cattle suffer most from lice infestation.

221. a. Spraying
b. Dipping
c. Rubbing devices
d. Feed additives
e. Dusting

222. Sprays are considered to be the most effective.

223. Ticks must get blood from an animal to exist.

224. a. They transmit diseases.
b. They cause livestock to have anxiety, anemia, expensive treatments, and cause inefficient feed use.

225. a. By spraying b. By dipping

226. Woodland grazing ranges from one cow per 5 acres on a regeneration area to as much as one cow per 40 acres on a heavy, unthinned timber area.

227. The objective of fence maintenance is to keep fences at or as near possible to the standard to which they were constructed.

228. a. Holding pen or pens and cutting pens
b. Working chute and catwalk
c. A funnel-shaped entrance to the chute
d. Headgate and squeeze
e. Calf table (for cow-calf operations)
f. Scales (for demonstration areas especially)
g. Loading chute

229. a. Steers are preferred because they are more docile than bulls.
b. Steers have more preferred beef qualities: Texture, tenderness and flavor usually develop better in steers than bulls.
c. There is a better balance in body development.
d. Steers sell for a considerably higher price.
e. The castration prevents indiscriminate breeding.

Number

230. Castration is best done when the calves are from 1 to 3 months of age. The best time is during cool weather--spring and fall. This is the period of least danger from blow flies and screwworms.

231. a. The use of a good, sharp, pocket knife, either cutting off the lower one third of the scrotum, or making an incision to expose the testicles. Pull the testicles and scrape the cord to sever the spermatic cord.
b. Use a Burdizzo castrator. The clamp is placed on the spermatic cord of one testicle at a time, clamped and held for a few seconds.
c. Use an Elastrator. This tool stretches a special rubber band which is placed over both testicles and, when released, shuts off circulation of blood to the testicles.

232. The use of the pocket knife and removal of the testicles is the most fool-proof.

233. The use of the Burdizzo castrator.

234. a. Horned cattle bruise each other, lowering the carcass value.
b. Horned cattle may hurt the person who feeds and handles them.
c. Cattle with horns require more space on feeding grounds.
d. Some horned cattle are inclined to boss other cattle.
e. Horned cattle usually sell from 1 to 2 cents per pound less than dehorned cattle.

235. a. Extra labor and equipment is required.
b. Ugly scurs may develop if dehorning is not carefully done.
c. There is danger of some loss from infection, screwworms and excessive bleeding.

236. a. Chemical b. Mechanical

237. Caustic potash or caustic soda may be used to dehorn very young calves.

238. This method is seldom used with beef cattle because calves are born in the pasture and run with their mothers and its use would require frequent handling and close observation of the herd.

239. a. Hot irons, either electric or heated
b. Spoons or tubes
c. Scoop dehorner (Barnes-type)

240. They cut the skin around the horn button then cut under the horn button and scoop it out to remove the horn growth cells.

241. Dehorning clippers or saws.

Number

242. Yes. Tools used for dehorning, except hot irons and electric dehorners, should be disinfected before and after each use.

243. a. Required by most purebred associations.
b. To be able to identify animals that belong to the owner.
c. To identify animals according to age as an aid in culling.
d. To identify animals for record keeping purposes.
e. To serve as a means of establishing legal title.

244. a. Branding
b. Earmarking
c. Tattooing
d. Neck chains
e. Ear tags

245. a. Branding b. Earmarking c. Ear tags

246. a. Hot-iron branding b. Liquid or caustic branding

247. Hot-iron branding, as it does not become covered by hair growth as soon as liquid branding. Also, the hot iron tends to change direction of hair growth, which makes the brand tend to stand out.

248. Earmarks can be more easily altered than brands. The ear may get torn by brush and may create a confusing marking.

249. The one serious disadvantage to tattooing is that the animal must be caught and the ear closely examined to identify.

250. The neck chains must be adjusted as the livestock grow older. On brushy range they are often lost as they get tangled in the brush.

APPENDIX III.--SELF SCORING SHEET

Question	Right	Wrong	Question Page	Answer Page

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CAUTION

Pesticides used improperly can be injurious to man, animals, and plants. Follow the directions and heed all precautions on the labels.

Store pesticides in original containers under lock and key--out of the reach of children and animals--and away from food and feed.

Apply pesticides so that they do not endanger humans, livestock, crops, beneficial insects, fish, and wildlife. Do not apply pesticides when there is a danger of drift, when honey bees or other pollinating insects are visiting plants, or in ways that may contaminate water or leave illegal residues.

Avoid prolonged inhalation of pesticide sprays or dusts; wear protective clothing and equipment if specified on the container.

If your hands become contaminated with a pesticide, do not eat or drink until you have washed. In case a pesticide is swallowed or gets in the eyes, follow the first aid treatment given on the label, and get prompt medical attention. If a pesticide is spilled on your skin or clothing, remove clothing immediately and wash skin thoroughly.

Do not clean spray equipment or dump excess spray material near ponds, streams, or wells. Because it is difficult to remove all traces of herbicides from equipment, do not use the same equipment for insecticides or fungicides that you use for herbicides.

Dispose of empty pesticide containers promptly. Have them buried at a sanitary land-fill dump, or crush and bury them in a level, isolated place.

NOTE: Some States have restrictions on the use of certain pesticides. Check you State and local regulations. Also, because registrations of pesticides are under constant review by the U.S. Environmental Protection Agency, consult your county agricultural agent or State Extension specialist to be sure the intended use is still registered.

Use Pesticides Safely

FOLLOW THE LABEL

U.S. DEPARTMENT OF AGRICULTURE